

# Successful Methods



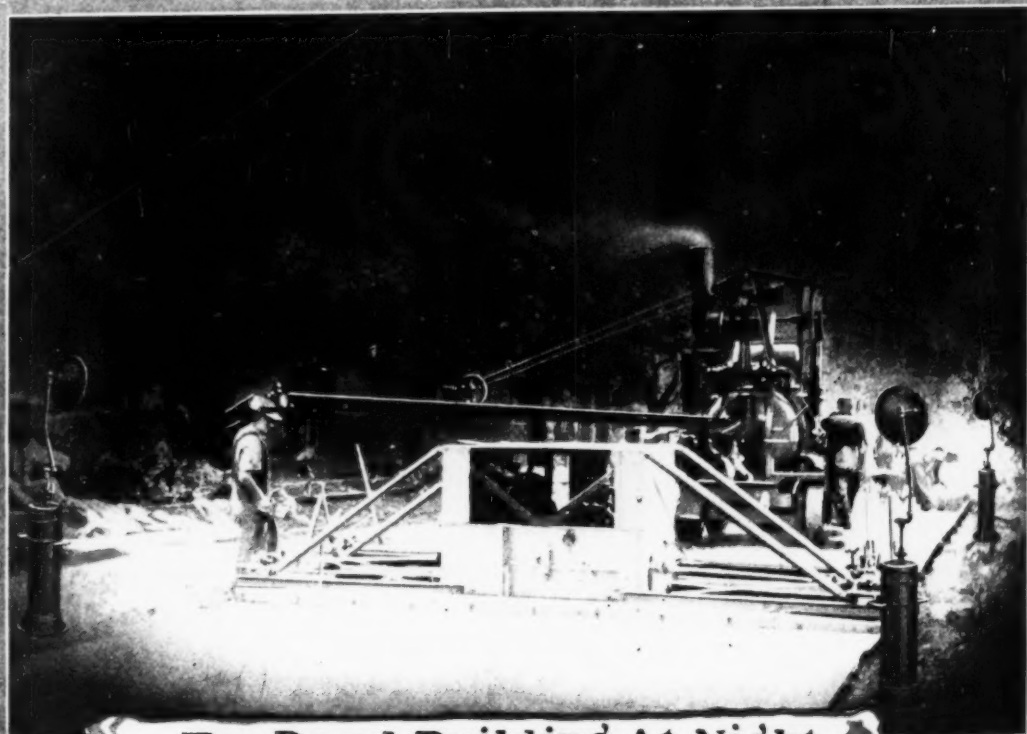
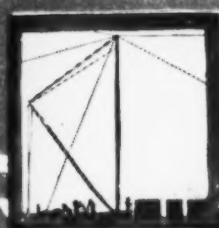
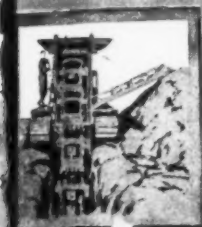
Construction · Road Making · Engineering · Industrial · Mining



Vol. 1.

July 1919

No. 1.



For Road Building At Night.





# HOWDY!

As John D. Wells says, we're "shy on formal greetin's" and "highfalutin' kowtows".

So this is just a good, old-fashioned "Howdy" to old friends and new from Lakewood.

## TO THE NEW FRIENDS

### *Just a Word About The Lakewood Policy*

We believe that a man going out to sell a contractor equipment for his job must know the necessary requirements so well that he will be of real service to the contractor.

Lakewood Engineers study the requirements of the job before attempting to recommend plant—

And in recommending plant they have only one aim—to recommend plant that will earn maximum profit for the user.

Lakewood service is yours for the asking. A request for it involves no obligation on your part.

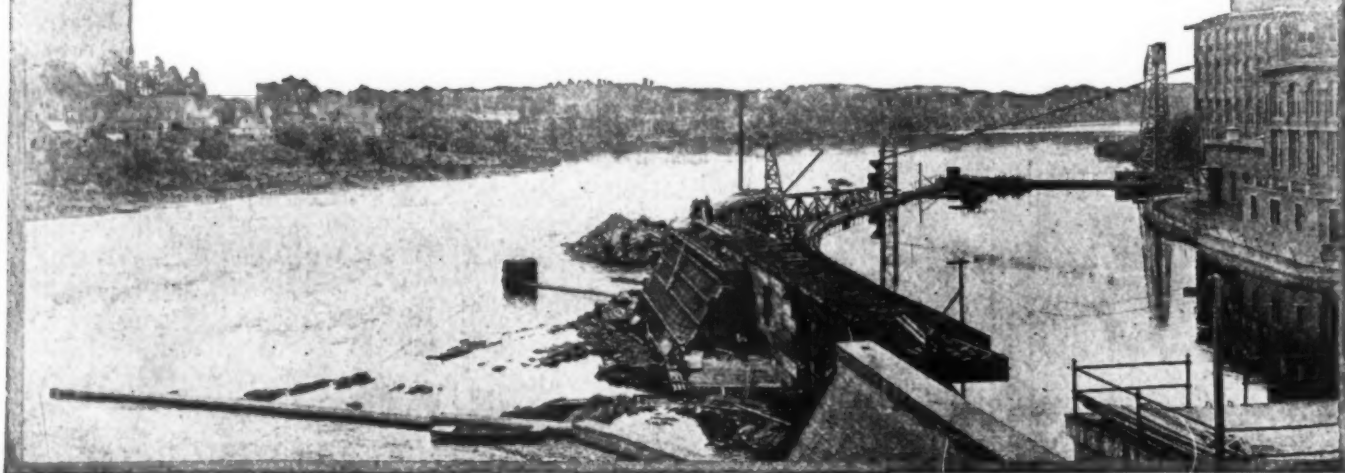
The completeness of the Lakewood line is shown in six pages of this issue.

*Let's Go!*

## THE LAKEWOOD ENGINEERING COMPANY

CLEVELAND, U. S. A.

*Offices in New York, Boston, Philadelphia, Washington, Pittsburgh,  
Detroit, Chicago, Milwaukee, Salt Lake City, Los Angeles, Seattle,  
Oklahoma City, Kansas City and Houston*



# Successful Methods

*A Magazine of Construction Service*

Published by  
**MANUFACTURERS PUBLICITY BUREAU**  
INCORPORATED  
140 South Dearborn Street, Chicago.

Vol. I

July, 1919

No. 1

## ACHIEVING AN IDEAL

"Let the Buyer Beware!"

This ancient business maxim has been discarded by progressive American manufacturers.

They have as an ideal the complete union of the interests of the producer and the user.

Coupled with this ideal, American feats of production, organization, and friendly and cheerful team work are the marvel of the world. They result from clear vision, determined action, detailed knowledge, and confidence between the buyer and the seller.

Foremost among great American achievements are such works as highways, buildings, railroads, dams, bridges, and drainage and irrigation projects. These great works are made possible only by the use of tools and equipment developed and produced by American engineers and manufacturers.

Men who build great and useful works must continually seek better tools and equipment, and more successful methods of using them. Men who make tools and equipment must strive to place better products in the hands of users. Then both profit.

All engineers and manufacturers know this ideal, many seek to achieve it. This magazine is intended to help point the way.

*This Magazine Will Be Sent to Men Who Can Use It.*



## Motor Trucks for Roads and Roads for Motor Trucks

**I**NCREASED possibilities for motor trucks are opened up through the declared policy of the United States Railroad Administration greatly to curtail the construction of spur or feeder lines," said John S. Cravens, Chairman of the Highway Transport Committee of the Council of National Defense in a recent address at Philadelphia. "The demand for transportation is constantly growing and some of the railroad authorities openly advocate the establishment of country truck lines, especially those running at right angles to the main rail routes. I believe this entente could be fostered to the mutual benefit of both parties."

Modern methods of transportation call for the use of machinery for the successful use of roads as well as their successful construction. It is a fact that only by the use of labor saving machinery which has been developed to a marked degree in America can the shortage and high cost of labor be met successfully.

Motor trucks and good roads must be thought of as essential to each other. The truck and the road are inseparable, and a nation-wide interest in both trucks and roads has resulted.

## Mutual Confidence Key-Note of Successful Road Construction

**I**T IS said that 90% of the business of the world is based on mutual confidence between the contracting parties. Confidence results primarily from a certainty as to the behavior of men under conditions of stress that must necessarily arise in the ordinary course of business relations.

The public wants roads, engineers want them built well, contractors want them built with economy and reasonable profit, and manufacturers and material men want to supply the best machinery and material. A mutual understanding of the requirements and problems of each is essential to economical and successful progress.

This mutual confidence is based not only on personal knowledge, but also on the ability of each contracting party to meet the other fellow half way. The ultimate aims of all persons contributing to the completion of a piece of work are more or less the same—to build roads, buildings and other engineering works as efficiently and economically as possible.

Officials of private corporations have reached this common ground of mutual understanding with contractors and builders to a much greater extent than men engaged on public works. The results generally have been fortunate for all concerned. Many public works officials recognize the importance of mutual confidence. The success of the engineering corps of the United States Army in building the Mississippi levees may be cited; and the large scale work successfully completed by some highway commissions is due to the broad minded construction policies pursued.

At the present time, when a vast mileage of roads must be constructed rapidly, the need for a broad conception of the administrative and financial problems in-

involved is necessary. Attention to this matter has been urged by bankers, politicians, business men and newspapers. The magazines devoted to the interests of construction work, such as *Engineering News-Record*, *Engineering and Contracting* and others, have repeatedly called attention to these facts.

A slogan that has been widely circulated among engineers and contractors in the last few weeks is "Let's Go." Release the blue prints, get the contracts, place material and plant orders, and put men at work. Roads will begin to stretch across the countryside, buildings will spring up, laboring men will be employed and contented, and merchants will sell calico by the bolt and eggs by the case. Mutual confidence and willingness to meet the other fellow half way oil the wheels of progress, and assure rapid and economical work.

## Fit the Tool to the Job

**T**HE making of a winning army from civilians taken from every profession and trade was solved by giving the man in the army that task for which his civilian experience best fitted him. It was not until this fundamental fact was appreciated that consistent progress was made. Similarly the contractor who buys construction plant without taking advantage of the experience of the manufacturer of the plant is overlooking a fundamental element of business success.

A manufacturer knows in detail his tool, when it can be successfully used, and methods to be followed in its successful use. Each tool sold is a new source of experience under a new set of conditions. A contractor knows in general the qualifications of many different kinds of tools for accomplishing a great variety of work. Specific and detailed knowledge of the type available to a manufacturer is hardly possible for him—nor is it generally desirable. A contractor operates many different kinds of plant.

Herein lies the strength of the manufacturer's service. Complete knowledge of the tool and repair part requirements under all conceivable operating conditions makes possible the fatherly supervision of the life of the tool, and maximum successful results from its operation.

## Fostering Contentment

**T**HE age of labor-saving machinery was begun by the invention of the wheelbarrow. Today the wheelbarrow is still a most important item on nearly every type of construction work.

Most contractors have learned that it pays to consider wheelbarrows seriously, that it pays to keep them in good repair, and that there is a big difference in wheelbarrows, which does not show up in the index of a catalog.

If you will watch your men when starting to work, you will find they fight for the good wheelbarrows, and that the fellows who have poor wheelbarrows to work with do less work, with greater effort, and consequent increased cost. The wheelbarrow is the hand tool of one type of workman, and his pride in the tool is worth fostering.





PREPARING THE WAY FOR PEACE IN FRANCE

# READY FOR RECONSTRUCTION



FILLING IN MILITARY TRENCHES  
IN FRANCE



AMERICAN ROAD MACHINERY  
IN ACTION

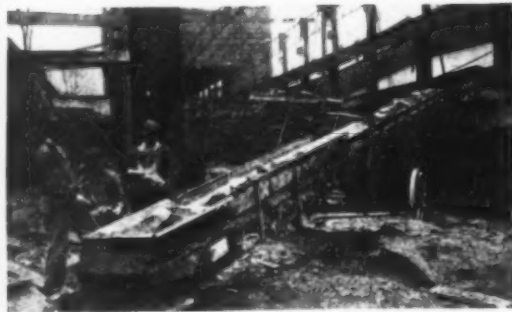


RUSSIANS USING AMERICAN MACHINERY

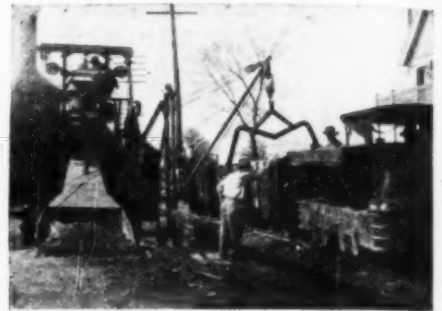


CAPTURED CONCRETE MIXERS

# Reducing Labor Costs



Loading Cars With Few Men

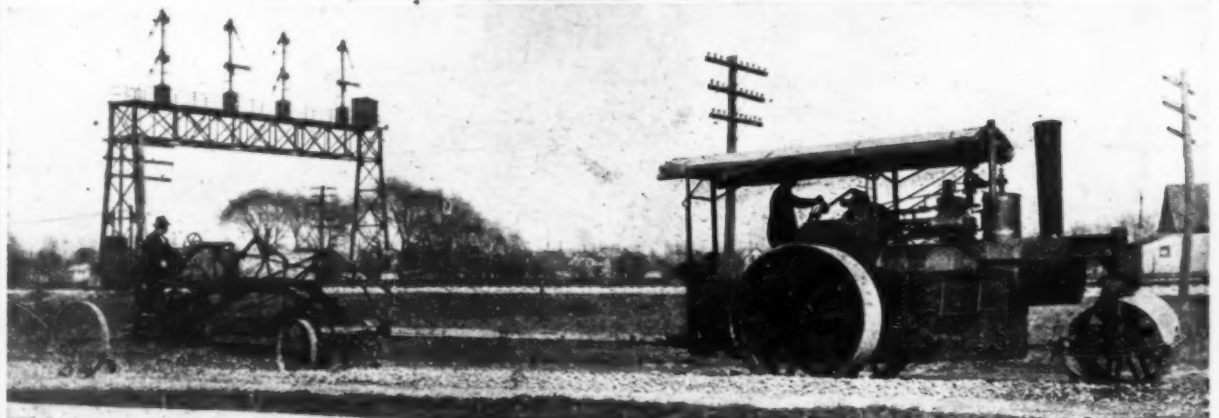


From Car to Mixer in Road Building



Grading  
for the  
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Utah

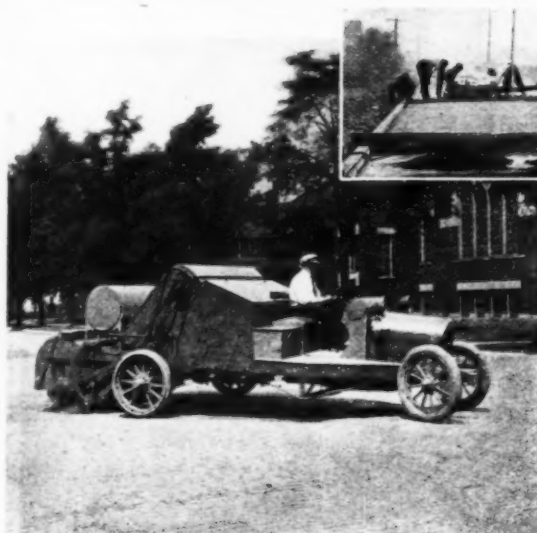
Making  
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With  
2 Men  
and  
Machines



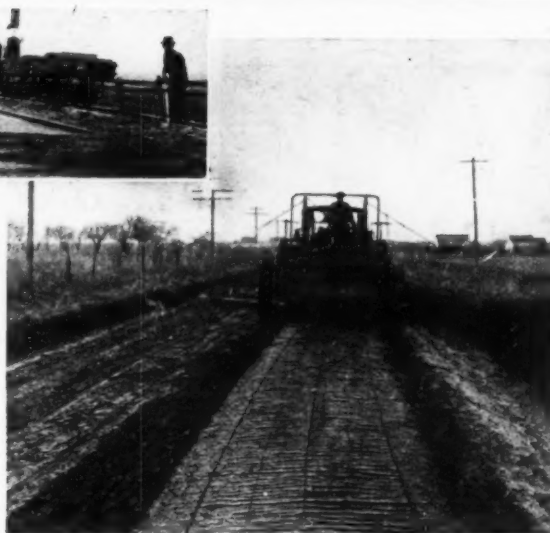
## AMERICAN METHODS



# With Machinery



An  
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Mechanical Methods  
Replace "White Wings"

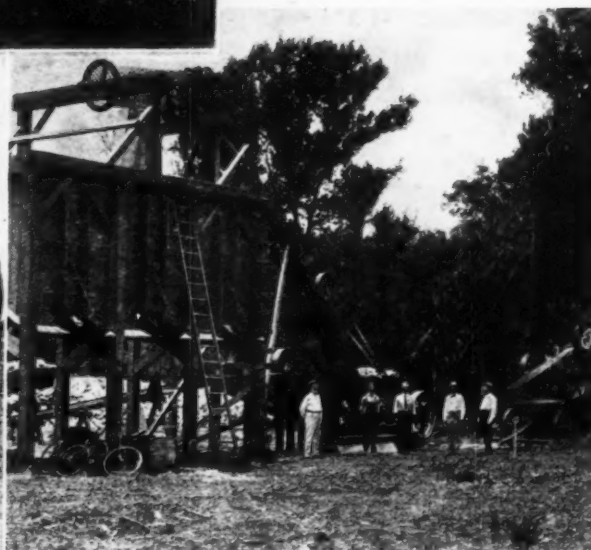
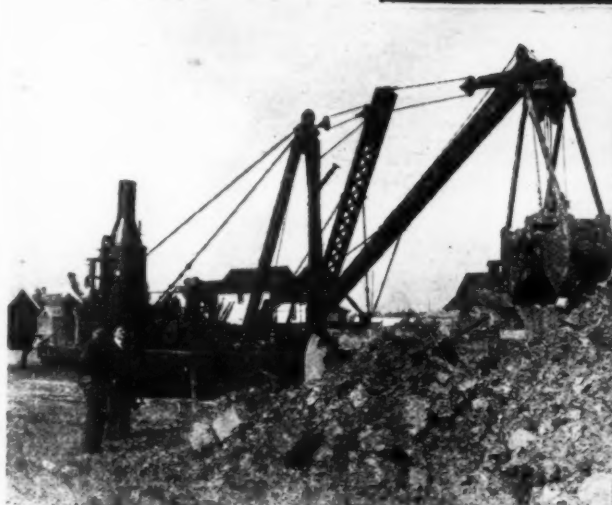
Making Dirt Roads Smooth



Pumping Water for Rebuild-  
ing an Old Highway

A Tough Machine  
for Hard Digging

Crushing Stone for  
Southern Roads



SAVING LABOR ❁ ❁





E. W. JAMES,  
General Inspector



T. WARREN ALLEN,  
General Inspector

**U. S. FIELD  
BUREAU OF**

Under J. H. Mc  
struction, these  
Millions



**ENGINEERS  
PUBLIC ROADS**

Donald, Chief of Con-  
Men Supervise  
for Highways



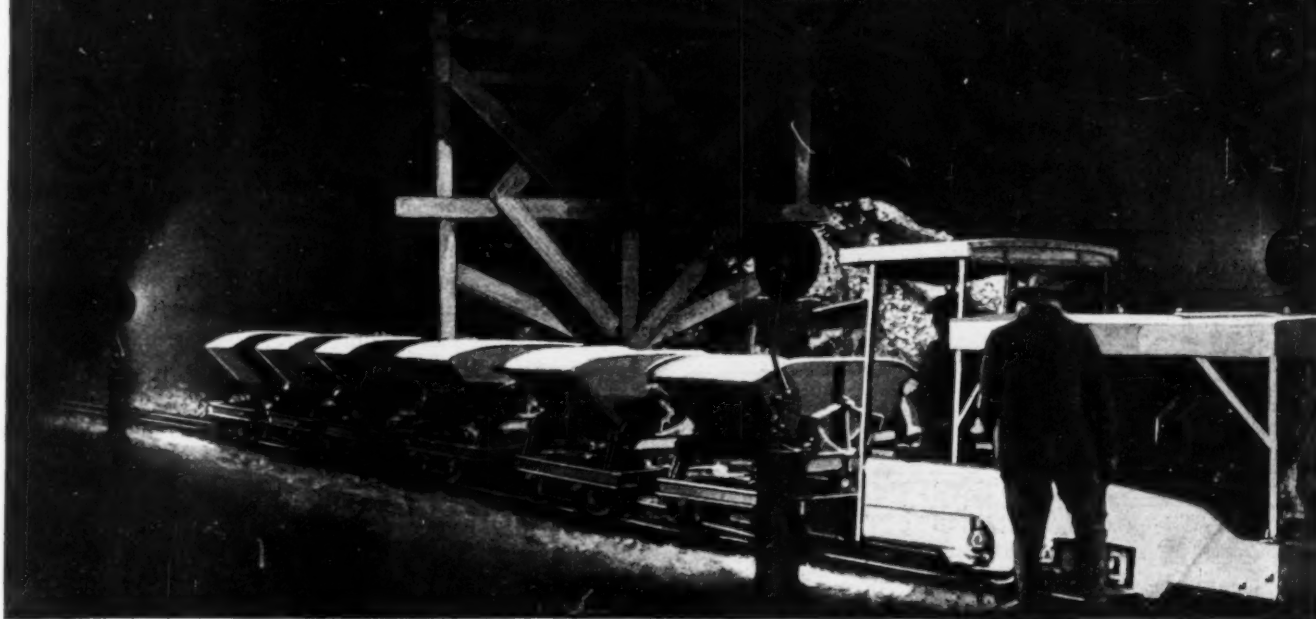
P. ST. J. WILSON,  
Chief Engineer

J. D. FAUNTLEROY,  
District Engineer  
Texas, Oklahoma,  
Arkansas and Louisiana

J. T. VOSHELL,  
District Engineer,  
Illinois, Michigan,  
Indiana and Kentucky



## ROAD BUILDING 24 HOURS A DAY



### How Quantity Construction May Be Obtained Through More Efficient Use of Plant—Machinery Solves Labor Problems—Night Crews Smaller

By WILLIAM ORD

*Building roads rapidly to meet present traffic needs depends on materials—which we have; efficient machinery—which can be procured; adequate labor supply—which is uncertain; and continuous operation—which is part of the answer.*

THE end of the World War finds this country with an immense mileage of roads to be built rapidly to meet the pressing traffic needs of the day. Houses must be built to provide places for people to live, the railroad, drainage and numberless other works constructed. In this work speed is essential, for during the war but little was accomplished in keeping pace with the normal growth of the nation.

#### QUANTITY CONSTRUCTION OF ROADS POSSIBLE

Speed of construction, and consequently, greatly increased production, is influenced by many factors, such as availability of materials—which we have; efficient machinery—which can be procured; adequate labor supply—which is uncertain; and continuous operation—which is part of the answer. Granting that materials and machinery are available, the coordination of the problems of labor supply and continuous operation furnish the rest of the answer. Labor supply and operation are inseparable, and a small amount of plant calls for an increased labor supply.

With an adequate supply of labor-saving machinery, the number of men required for operation is reduced and the labor problem partly solved. Yet the rule works both ways. With plenty of both labor and machinery, by obtaining more continuous operation, such as by operat-

ing 24 hr. a day, the output is greatly increased. A small plant operated continuously will produce more than the spasmodic operation of a large plant.

The length of the working season is another controlling factor in securing quantity construction. Verily, "making roads while the sun shines" is a matter of dollars and cents to the road builder. Within the glare of the night lights many miles of road may be built in the future. With a short working season, which lasts only from 5 to 8 months in some sections, the need for continuous operation is most emphatic. It has been estimated that from 20 to 24 working days a month is a good average for most highway construction jobs and this estimate makes no allowance for delays from any cause other than bad weather. Bad weather is particularly effective in causing delays in material haulage where teams or motor trucks are used.

Grading is done in the day as much in advance of the paving as circumstances will permit. But it is frequently necessary to carry on grading and paving work at the same time and it is essential that the roadway be unobstructed while grading is in progress if economical results are to be secured.

#### ADEQUATE PLANT ESSENTIAL

The efficient making of concrete roads leads to a division of the work in 4 operations:

1. Unloading the material (sand, stone and cement);
2. Loading and hauling the material to the mixer;
3. Mixing the concrete, and
4. Finishing the surface.

Economical management of the work involves the combination of these operations so that cars of raw ma-

material are unloaded quickly to save demurrage charges and to insure sufficient storage to make the operation of the plant independent of railroad deliveries; economical methods of reloading on the haulage equipment; rapid and uninterrupted transportation to the mixer; continuous operation of the mixer to obtain the largest possible number of square yards of completed road, for the progress of the mixer is the progress of the road; and lastly a thorough finishing to make an honest and presentable job. In all these operations the reduction to a minimum of the hand labor required is the only sure road to true economy.

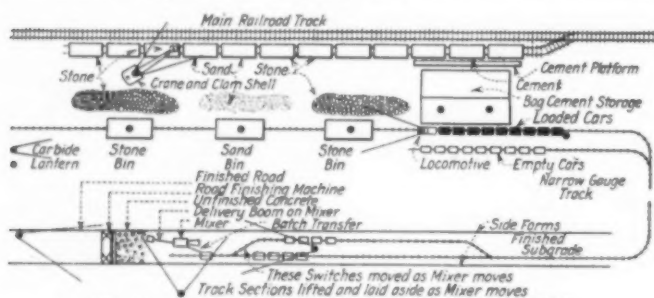


FIG. 1. LIGHTING FOR SINGLE MIXER JOB

Generally, it will be necessary to operate the unloading plant during the night shift. This, however, is not unusual at the present time. A great many contractors are doing much of their unloading at night in order to get the most use out of their plant and in order to save demurrage on railway cars. Night unloading is also frequently necessary in the case of bunched deliveries of freight cars and shortage of material due to delayed freight shipments.

#### LOCATION OF LIGHTS FOR NIGHT WORK

In the typical unloading plant layout shown in Fig. 1, gravity storage bins are placed at intervals along the railroad siding with narrow gauge track running under the bins past the cement shed and then to the mixer. The material is transferred from cars to bins or cars to dock piles by means of a clam shell bucket operated by a locomotive crane. Sufficient storage space in excess of bin capacity is provided to make operation independent of railroad delivery.

Materials are drawn from the gravity bins into road cars having separate and properly proportioned compartments for such materials, and a water-tight box for cement. As no cement leaves the storage shed except in the water-proof box in the road car, great economy is effected in handling it, regardless of whether the material is received in bulk or in sacks.

The layout illustrated in Fig. 2 involves the use of a tunnel arrangement instead of the bins. This method of loading cars is particularly well adapted to a large job on which two concrete mixers are operating.

The methods of lighting these types of unloading plants are shown in Fig. 1 and 2. The headlight on the unloading crane should be of considerable power. This light is particularly efficient since it swings with the revolving of the crane, continuously illuminating the bucket and the material being handled.

The only lights required at the bins are lanterns, one being placed at each bin gate and another being provided as a hand lantern for the man operating the bin gate. A good tunnel man does not want a great deal of light; he prefers to work in the darkness.

The labor required for the night unloading operations is less than would be supposed. The ordinary method of handling night work is to do only those things that are absolutely necessary for laying the pavement, other work being done in the day time. While night work is generally much less efficient than day work a considerably smaller number of men are employed.

#### HAULING TO THE MIXER EASIER AT NIGHT

The main advantage in operating trains at night instead of day time is the fact that traffic along the highways is small and consequently delays at crossings and other points where road traffic might interfere are decreased to a minimum. By hauling material in road cars instead of motor trucks or wagons, construction work delays due to wet weather do not enter into the scheme of things to any great extent. The handling and placing of concrete is not discontinued unless it is raining so hard as to damage the surface of the finished concrete. This method of transporting material, together with independence of weather conditions reduces rehandling to a minimum.

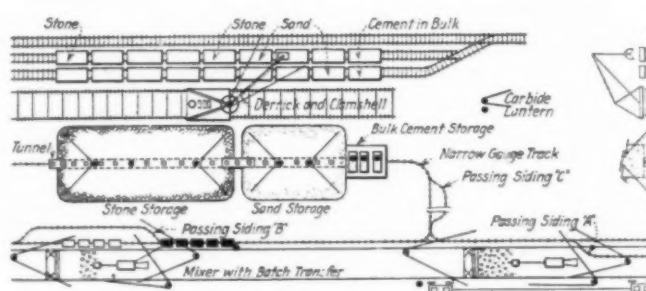


FIG. 2. LIGHTING FOR 2 MIXER JOB

The locomotive headlight and the train tail light will give sufficient illumination for night hauling. The train men also use hand lanterns.

Train crews should consist of 2 men for night operations the same as ordinarily used in the day—that is, the locomotive engineer and one train man. No track work will be done. The size of the track crews, therefore, are increased in the day time to provide for night operations.

#### MIXING AND FINISHING AT NIGHT

Since the progress of the mixer is the measure of the progress of the completed road, continuous operation of this unit is the key to quantity construction. All operations up to this point have been for the purpose of keeping the mixer supplied with raw material—the mixer makes the road.

The complete batch method of handling material which is illustrated in Fig. 1 and 2 may be divided into 6 operations:

1. Cement cover removed. Two men attach bail to car body.
2. Mixer operator lowers skip. Weight of skip raises car body from running gear.
3. Batch transfer is swung around until batch is over charging skip ready to be dumped.
4. Aggregates are dumped into charging skip.
5. Empty car body is swung back over running gear.
6. Operator raises skip to discharge batch into mixer. As skip raises, car body is lowered on running gear. Bail is detached. Cycle of operation is repeated.



For night work this method of operation offers many advantages. No material is wasted and there is no fumbling on the subgrade picking up material piled there. A uniformly proportioned concrete mixture is obtained without the cost and trouble of measuring as all this work is accomplished at the loading station.

The number of men required at the mixer is reduced to a minimum and consequently night work is made much easier to handle. Ordinarily the same number of men will be used at the mixer for the night shift as for the day shift. Each man has certain duties which he repeats day after day and learns to perform automatically so that night work is no more difficult than day work.

High power lights are required at the mixer. The most convenient places for these lights are shown in Fig. 1 and 2. It is important that the switching points be well illuminated and that the mixer operators have sufficient light. It is well to have an extra man around the mixer to look after odd jobs and to assist the train men in the rapid handling of cars.

Tamping and finishing machine work follow close upon the mixing operations. This work requires good illumination, but since the use of machines makes the finishing process more or less automatic the chief use for lights is to illuminate the finished surface and to locate any foreign material which may be imbedded in the concrete so that it may be removed before the concrete sets. The night finishing crew is the same size as the day finishing crew.

#### CURING AT NIGHT

Curing always has been done at night by many contractors. This has been due to the fact that the pumping plant frequently has been so small that it could not supply a sufficient amount of water to provide for the mixer and also for wetting the finishing work. Wetting down the finishing work is, however, more conveniently done in the afternoon.

Covering and all work of similar nature, such as trimming shoulders, etc., should be done by day crews of adequate size.

Form setting should be done in the day and sufficient length of form laid to provide for the night operations. This necessitates more side forms and a larger crew placing forms in the day time. Pumping plants will be operated continuously. Hand lanterns are the only lights necessary at the pumps.

#### LESS LABOR REQUIRED FOR NIGHT WORK

For 24-hr. day operation 3 shifts are necessary. It is seldom, however, that more than 2 shifts are necessary or that it is economical to operate more than two shifts. The following is a list of the actual crew required for a night shift operating two mixers on a 2 mile average haul for materials:

<b>Unloading and Hauling:</b>	
Crane operator .....	1
Crane fireman .....	1
Clean-up men in cars .....	2
Train superintendent .....	1
Engine runners .....	6
Trainmen .....	6
Bin gatemen .....	5
<b>Mixing and Finishing:</b>	
Batch transfer men .....	4
Track men .....	2
Mixer operators .....	2
Firemen .....	2
Concrete spreaders .....	4
Finishing machine operators .....	2
Foremen .....	2
Pipemen .....	2
Pump operators .....	2
<b>Total men for night shift.....</b>	<b>44</b>

#### GREAT ECONOMIES EFFECTED BY NIGHT WORK

While a road is under construction, the same rules of business economy apply as in the case of the construction of a city skyscraper.

In this work, it is customary to do night work whenever possible, for during the construction period the money invested is returning no income.

The actual loss on a building that costs \$500,000 and takes a year to construct is \$30,000 based upon interest at 6%. If in the case of one 10-mile section of road the investment were \$300,000 the interest loss for this period while the road cannot be used (sections of the road may be in service, but the

had portions reduce hauling efficiency), based on interest at 6% is \$18,000. But this loss is small compared to the loss of time to users of the road and the inconvenience to traffic, with the accompanying prevention of profitable hauling. The losses due to these causes are difficult to estimate, but they are large.

Skilled labor for the operation of construction machinery is at a premium. Some relief, however, may be found in the return of the men who have served in France. These men have received a very thorough training in the operation of all kinds of machinery and are now available for work of this kind.

From the contractor's standpoint, perhaps the greatest saving from night work comes in the reduction of overhead expense on equipment. This overhead is made up of yearly depreciation (which frequently totals more than the payroll cost of operation), interest, lost time, office expense and other items. The saving in overhead is largely clear profit and may amount to as much as \$10,000 on a single season's work on a 10-mile concrete road job.

It must be remembered also that the largest monthly payments are based on completed pavement. This reduces the amount of cash the contractor has tied up. By completing a maximum number of miles in the least possible time the greatest net profits are obtained.

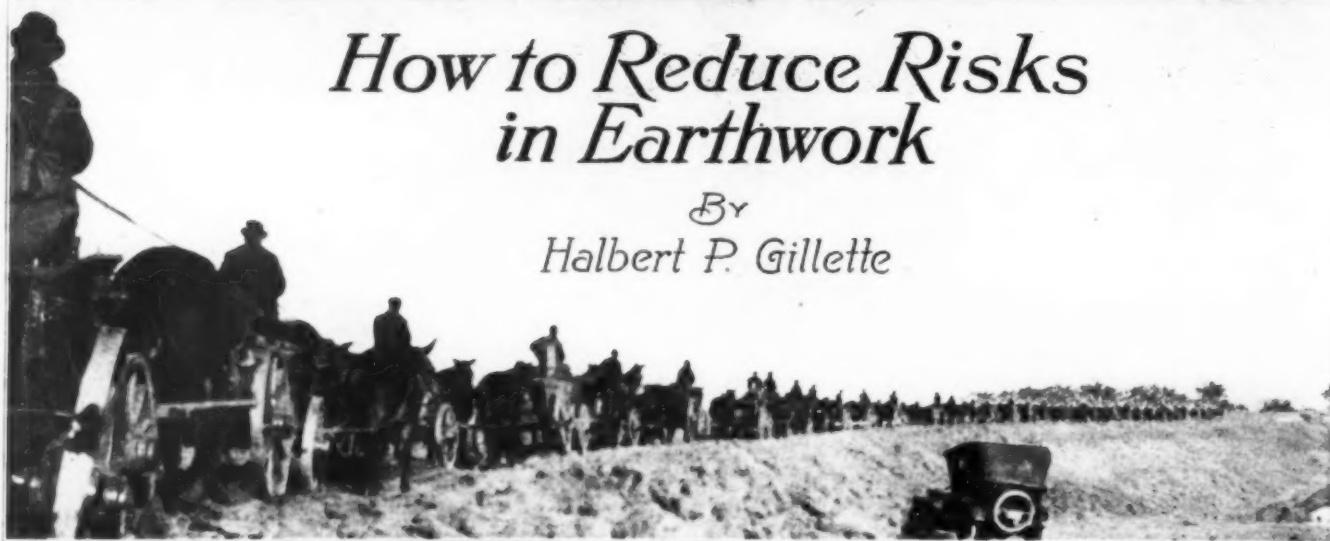


LAYING CONCRETE SUCCESSFULLY IN WET WEATHER

# How to Reduce Risks in Earthwork

By

Halbert P. Gillette



*Mr. Gillette gives some of his personal experiences in handling earth work. He is a successful engineer and contractor and the editor of Engineering and Contracting. His books on cost analysis and methods of earth and rock handling are widely known.*

**F**EW classes of construction are so difficult to control economically as earth excavation. Rainy or freezing weather may completely upset the best laid plans and cause a severe financial loss. Usually most of the working gangs are common laborers, quite irresponsible, quitting at the slightest provocation, often with no provocation.

The character of the earth itself may vary greatly from week to week or even from hour to hour. The length of haul is seldom constant even for one day. Small wonder, then, that no ordinary class of contracting is more hazardous than earthwork.

## EXPERIENCE AND WORK NECESSARY IN ESTIMATING

The first great risk is taken when the estimate is made as to the classification of the excavation. Here it is that experience counts so much in favor of an older man, and lack of experience hits a younger man so hard. But a young contractor is not necessarily without means of self protection. He can employ an experienced superintendent, he can dig test pits and make earth soundings.

When I first went into the contracting business, I soon learned never to bid on excavation until I had "prospected" the job pretty thoroughly. It is surprising how much can be accomplished in a short time in this manner.

Sounding with rods is an expeditious way of ascertaining the depth to ledge rock or to hardpan, and it will also disclose the existence of boulders. But in an unfamiliar country, it often is necessary to dig test pits or small wells, so that the toughness of the earth can be judged by observing the resistance to a pick.

Often there is insufficient time to prospect the ground thoroughly. Then, if the work is in a section where your experience has been limited, don't bid at all if the earthwork is extensive.

## PROSPECTING FOR FACTS

Some years ago, a firm of young contractors in New York City asked me to assist them in estimating the cost

of a large job of excavation in New York State. The cuts and fills were heavy, and the engineers had made no soundings. The engineers had estimated that the excavation would be 75% solid rock and 25% earth. After walking over the line, I asked one of the contractors what he thought of the "three to one" classification the engineers had made. He replied that it seemed to be "any man's guess," but that he presumed the engineers were approximately right as they had been engaged for months on the surveys and in planning the construction. Had he known more about common engineering practice, he would have had little faith in that guess as to classification. I explained to him that about the last thing that the average engineer does on such a survey is to estimate the classification, and that then he usually guesses, often wildly. "Well," said the contractor, "we want to bid on the job, and it's too late now for us to do more than guess also." He was surprised when I assured him that in the two days remaining before the bids would be opened, we should be able to estimate pretty accurately what percentage of the excavation was solid rock. Since many of the cuts were 50 to 60 ft. deep, and quite long, it looked like an impossible job to do much sounding in two days; as for adequate test pit sinking, that was impossible.

Jutting from the surface of the earth at frequent intervals was rock (gneiss) that appeared to be ledge rock, and it was this appearance that had led the engineers to estimate 75% solid rock. I pointed out to the contractor that ledge rock in southern New York State is usually grooved in a North and South direction as a result of the grinding action of ancient glaciers; but that none of the outcropping rocks that we had seen on that job were grooved or scratched in that regular manner. Hence they probably were boulders. There were other geological facts that led me to the same conclusion, but it remained to prove the inference beyond doubt.

I had noticed along the line several wells that supplied water to farmers, and these, I believed, would be rather deep dug wells—real test pits for our purpose. We were able to find the men who had dug some of these wells, and to learn from them that they had dug 50 to 80 ft. without striking solid rock, and that they had encountered few boulders.



In order to confirm this testimony, we put several small gangs of laborers at work sounding with rods. The results of that sounding showed that there was no ledge rock at all in any of the cuts. The subsequent excavation proved this conclusion to be substantially correct.

Naturally these contractors bid a fairly stiff price on earth and very low on rock, and were the lowest bidders.

#### ADEQUATE PLANT REDUCES WEATHER RISK

In estimating both the classification of excavation and the toughness of the materials, any nearby cuts should be examined; and local men who have done any excavation should be interviewed.

Having secured the job, it is important to reduce the bad weather risk by starting excavation as quickly as possible, and by using enough plant to rush it through before the autumn rains start. Here it is that the inexperienced contractor is apt to err. He may not order all his plant until he signs the contract; then he usually orders neither enough plant nor spare parts. Delays occur in getting the plant on the job, and several weeks of good weather may be lost before the work is going "full swing." Even then the "swing" is not "full" enough because of pennywise attempts to save money on plant investment.

I recall that a certain contractor on the deepening of the old Erie Canal in 1896 made a profit where his neighbor contractors lost money, simply because he bought, begged and borrowed a lot of equipment so that he was able to finish before the ground froze.

Have a liberal surplus of plant capacity, for surplus plant is the best investment on an earth moving job.

#### FIT THE PLANT TO THE JOB

The next important risk to eliminate is the risk of using a relatively uneconomic method or machine. There is no better way of reducing this risk than by having daily, weekly and monthly reports of the yardage moved by each gang. This is often not so easy of accomplishment as it sounds. Usually the only practical way of estimating the daily yardage is by counting the loads; but loads may vary considerably in size, and it may not be easy to keep tabs on the number of loads.

Carloads and wagonloads vary because of differences in the kind of earth, differences in the resistance to traction, difference in attention given to the loading, etc. Study every cause of variation in size of loads with a view to learning how to estimate the "place measure" size of a load under given conditions.

#### ESTIMATE YARDAGE ACCURATELY

Your own estimates of yardage based on the count of loads should be compared with monthly cross-section estimates made by engineers. Do not think the engineer

is necessarily wrong because his monthly estimate is far below your estimate. Perhaps your "tally" is wrong. More probably you have estimated too liberally as to the size of the average load. Buy 2 mechanical counters or "tally machines" for use at the pit and dump.

My brother, W. A. Gillette, has devised a satisfactory method of estimating the daily yardage handled by drags, fresnos and wheelers. A timekeeper on horseback rides from gang to gang, spending about 20 min. at each gang, during which time he counts the number of scraper loads moved by the gang. Three or more such counts are made every day for each gang, and upon these counts is based an estimate of the yardage excavated each day by every gang. The accuracy of this intermittent timing method of estimating yardage is astonishing. The engineers' monthly estimate seldom differs more than 5% from the estimate thus made by the timekeeper. The great merit of such daily estimates of yardage consists in showing at once the relative efficiency of different methods, machines and men.

#### COMPARE LABOR COSTS WITH MACHINE COSTS

I have mentioned the unreliability of most common laborers on grading work. This unreliability, coupled with the high wages now paid to common laborers, is leading to a greater use of machinery than ever before, even on small jobs. In China, with wages at 15 ct. a day, machinery could seldom compete with hand work, for the interest, repairs and depreciation on the plant alone exceeded the cost of doing the work by hand, in most cases. That is one extreme. At the other extreme we now have American unskilled labor getting 30 to 60 ct. an hour, the average being about 40 ct. Skilled labor has risen about 60% in price as compared with a rise of about 100% for unskilled labor. Machinery has not risen in price as much as skilled labor, and excavating machinery grows better every year. Hence it is that nearly all of us must revise our pre-war ideas about the use of machinery.

High wages lead inevitably to a greater use of machinery. This has long been evident on the Pacific Coast where contractors found it profitable, long before the war, to use more machinery than was customary in the Central, Southern and Eastern states. Wages on the Pacific Coast averaged about \$2.50 a day for common labor prior to the war, whereas about \$1.75 was the average in the East. That difference alone justified the greater use of machinery in the far West. Is it not clear, then, that with common labor wages double what they were five years ago, there must be a greatly increased use of machinery in construction work.

Hereafter the slogan of the far-sighted contractor will be: More power and less muscle; fewer men and greater hustle.





## A TEAM OF OLD TIME CONTRACTORS WITH MODERN IDEAS OF SERVICE



A. E. WELLS



F. A. WELLS

### Two Brothers Who Have Done Well in the Contracting Business—So Well That They Handle Work Amounting to \$4,000,000 Annually

**"T**HE unit costs you mention are preposterous. Such costs cannot be secured under present war conditions."

"These costs can be secured and have been secured."

"Where?"

"On the aviation camp work at Middletown, Pa.," replied Col. Marshall.

"Who was the contractor?" asked the incredulous officer, who was making a speech to justify certain high costs on government cantonment work.

"Wells Brothers Co., of Chicago," replied Col. Marshall.

Thereon hangs the tale.

Wells Bros., like many other large general contracting firms, went into government construction work because they wanted to help win the war.

"And I believe," said F. A. Wells in discussing the war work of the construction division of the army, "that no cleaner or more economical work was done during the war than that turned out by the construction division of the army. Every contractor, every engineer, and every laborer put his whole soul into the job."

"I fought to secure low prices on material and low

costs of construction, because I believed that thereby I was helping win the war. Or, I should say, my brother and I together tried to do our part in this way."

The team work by the brothers who comprise the firm of the Wells Bros. Construction Co., has been one of the contributing factors to its great success. A. E. Wells devotes much of his time to dealing with the architects and obtaining work for his company. F. A. Wells looks after the actual construction, estimates and similar details. But while this is the ordinary lineup on most jobs, each one is capable of taking hold of the other's work if occasion demands. A. E. will work on the right of the pole and F. A. on the left of the pole, or vice versa. The team pull together like two steady horses.

Team work on a cost-plus basis in construction work results in low costs and honest workmanship. These brothers began to do cost-plus building work years before it became so popular. The Rand-McNally building in Chicago was constructed by them on this basis in 1912, and since then they have handled a steadily increasing amount of work of this nature, which has been developed by their reputation for fair dealing and efficient work.

The firm dates back to 1871 when Wells Bros. started in business as masonry contractors. In the early days all building work was done by a succession of small contractors, the mason, the carpenter, the plumber, and a multitude of other small fry. At the present time most large buildings are put up by general contractors. The old Lexington Hotel was built in 1892 according to this plan and it was the job on which Wells Bros. branched out into the general contracting business wherein they handle every phase of the work.

The key-note of the success of these brothers has been their sincere desire to help the owner and the architect obtain a good job.

"In the old days," said F. A. Wells, "contractors were not professional men. At the present time we look upon ourselves as professional men with a reputation to maintain. This is our idea of service, and the fact that we have given this sort of service has been a source of great satisfaction to us."

General contractors are really all that the name implies. It is an interesting fact that there are not more than 300 such contractors in this country. These brothers built the White Sox ball park, the Auditorium Annex, and the foundation for the Blackstone Hotel, all in Chicago; and also built the Belvedere Hotel in Baltimore, and the Masonic Temple in New York. The other important buildings they have erected during an experience covering nearly 50 years are too numerous to mention. Besides these and numerous other large works, the

firm built hundreds of workmen's houses at Hammond, Ind., for the United States Housing Corporation during the war. They are now working on a big concrete viaduct for the new Pennsylvania station in Chicago. In all the firm handles about \$4,000,000 in construction contracts annually.

When the time comes to hurry they can move quickly. The concrete fire-proof building for the Excelsior Motor Manufacturing & Supply Co. of Chicago, which is 600 ft. long, 135 ft. deep and 105 ft. high, was finished in 84 days. Efficiency of this kind calls for organization and service. Their business enterprise was again shown during the war when they finished \$2,000,000 worth of work for the government.

The story of the methods and policies of this team of brothers who have built up one of the strongest and most efficient organizations in this country for doing high class work is simple. Like all men who have accomplished things they have kept everlastingly at it. They held continually before them the ideal of efficient service and above all things the satisfaction of the customer.

"When I was 13 years old I started in the contracting business following in the footsteps of my father," said F. A. Wells. "My first job was driving a mule on a brick hoist when the old Bower Building of Chicago was being constructed. I celebrated this event by falling into the basement and putting my shoulder out of commission, and," he continued, "I have not had a fall since!"

## SERVICE HINTS

### DERRICK HINTS

Use nothing but tough, clear sticks—the quality of the timber determines the capacity of the derrick.

Larger timbers are necessary for the same capacity where the lengths are greater.

The shorter the mast for a given length of boom, the smaller becomes the capacity.

Only recklessness permits loading the machine close to the falling-down point.

Use fittings shaped so that bending and twisting are reduced to a minimum.

Have fittings designed to relieve the timbers of bending stress as much as possible.

Light rings and straps compel the timbers to carry all bending and eccentric loads.

Use steel straps for irons on the ends of timbers with bolts that can be tightened as the wood shrinks.

Hollow castings stuck on the end of the timber will get out of plumb when the timber shrinks.

See that fittings have a large number of bolts and that shearing lugs are provided for setting into the timbers.

Use cable strong enough to develop the full strength of the timbers and fittings.

The number and cost of sheaves and irons are the same whether weak rope or strong rope is used.

Use plenty of guy lines.

### SIMPLE SHOVEL TESTS

The ease with which a man shovels depends largely upon the lift, particularly with a short-handled shovel. There are two methods of measuring the lift. The first method is by measuring the drop from the end of the handle to the floor, the back of the shovel being placed squarely upon the floor. The second method, which is by far the commonest, is to place the shovel as shown in the figure with the back end of the handle on the floor, and measure the distance from the top of the shovel to the floor with a rule.

Most shovels are given a certain lift by the manufacturer and are known as low-lift, medium-lift, and high-lift shovels. This lift, however, can be varied to suit the customer on a large sized order.

The most desirable lift is a matter for each man to determine for himself. As a general rule a medium lift shovel is the best for the ordinary run of work. The low lift goes into the material somewhat better and is preferable for any operation that approaches speeding. High lift shovels usually are used for scooping work or work in which it is not desirable to have a man bend over so much.

Shovels may be tested for strength by nailing a cleat to a bench, and suspending a weight from the end of the shovel some information as to the strength may be determined. A common test is to require that a 200-lb. weight suspended from the end of the shovel for a period of two minutes shall not distort it materially.

## SIMPLIFY THE PIPE LINE WORK

How Joints Are Adjusted and Spaced—  
Swing Pipe Operation



SWING PIPE WILL REDUCE  
NUMBER OF HOSE CHANGES

the length of expensive hose required and the number of times the hose has to be changed.

Expansion joints should ordinarily be located from 800 to 1,000 ft. apart, at points where trouble from expansion may be expected. Each joint allows

for about 12-in. change in length by means of a brass pipe which telescopes into a casing through a stuffing box. The iron pipe line is connected to each end of the joint with ordinary unions. The air chamber shown in the figure is not essential to the joint, but it is of considerable value in preventing water hammer, protecting hose and securing a steady flow. Every second or third expansion joint may well be equipped with an air chamber.

The swing pipe shown in the illustration is made of a nipple and elbow screwed into a tee, to which two or more lengths of pipe are coupled, and the mixer hose connected with the end. The swing pipe is laid toward the mixer from the tee, and when the mixer passes the tee the pipe is thrown over and laid in the opposite direction. By spacing tees about 200 ft., and screwing on or removing lengths of pipe as the mixer progresses, the amount of hose required is reduced to the minimum.

## FLOATING A RAILROAD TO PLACE

**A.** F. HARTIGAN of Chicago, in laying a standard gauge track to the site of a large industrial plant which was practically under water, built the track in sections, using cedar ties, and floated the track to place. The track was anchored to preserve the alignment. Cars loaded with sand were run out and the material dumped in ridges on which the workmen stood in working the filling material under the ties.

## WAR MACHINERY FOR PEACE

How a Gasoline Operated Crane in France  
Ran 25 Days Continuously

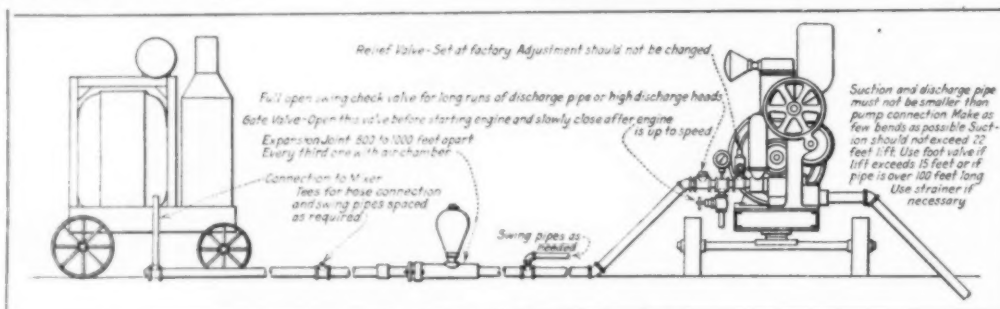
**G**ENERAL Forrest of Civil War fame summed up his philosophy of warfare in the phrase, "Get there first with the most," and this is good warfare, both in the A. E. F. and in business.

Conditions in France called for a machine which could be transported readily over ordinary macadam roads at a moderate rate of speed under its own power or at speeds approximating 10 miles an hour when towed behind a motor truck. Gasoline power and a full circle swing also were required.

The jobs that the cranes tackled included not only the unloading, reloading and handling of shells, ammunition and supplies of all kinds, but also the transferring of loads and furnishing assistance in the reclamation of trucks, whenever accidents along the highway necessitated such work. The machine also was to be used for filling shell holes and work of a similar nature.

To permit the hauling of such a heavy machine at high speed, a specially designed traction truck with

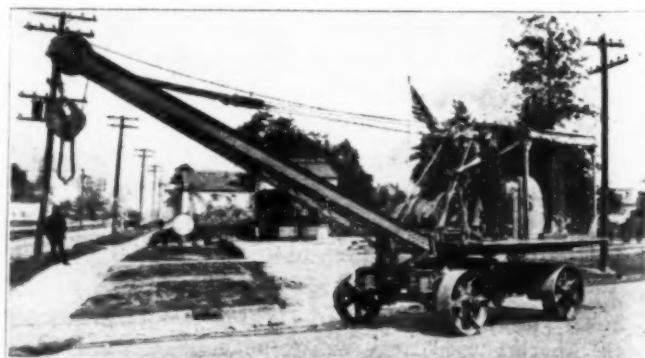
knuckle-jointed steering wheel which could be steered in a manner usual for automobiles, was used. When moving under



PUMPING PLANT LAYOUT FOR A ROAD JOB

its own power, steering was accomplished by an attachment from the front end of the turntable whereby the swinging of the turntable controlled the steering connection. Springs were introduced between the axle and the truck body to absorb the shocks due to inequalities in the road surface. The rear wheels were driven with sprocket chains, which were readily detached when the crane was to be hauled by motor truck. These driving wheels were further equipped with brakes to permit the control of the machine upon grades.

It was a common occurrence to keep the engines running and the cranes at work for a week or ten days without stopping. One crane was in continuous use for a period of 25 days and nights.



A MOBILE ARMY TOOL





## INDUSTRIAL RAILWAY HAULAGE FITS ILLINOIS CONDITIONS

By B. H. PIEPMEIER

Construction Engineer, Illinois Department of Highways

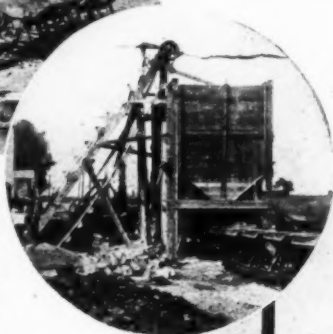


STORAGE BINS FOR SAND AND GRAVEL

**I**NDUSTRIAL railway equipment is efficient for road construction in Illinois. The State Division of Highways during the last few years has had considerable experience in the use of industrial railroad equipment in the handling of road materials. When the details of loading and hauling are supervised properly, the material can be hauled economically. The advantage of equipment of this kind is that hauling can be done regularly regardless of weather conditions. Road conditions in Illinois are affected seriously by rainfall and frequently the ordinary construction job is tied up for weeks on account of the inability to deliver material. The average construction season is short and

it is necessary, therefore, for the contractor to design his hauling equipment so as to utilize every possible day during the construction season.

On three large State jobs of 5 months' duration during 1914, 1915, and 1916, material was delivered by industrial equipment on an average haul of  $2\frac{1}{2}$  miles at a cost of between 10 and 12 ct. per ton mile. The cost given was obtained from the use of rented industrial equipment where the rental price was more than one-third of its cash value. The cost of hauling, therefore, would have been reduced slightly if a more reasonable depreciation charge could have been made.



TEN-TON LOCOMOTIVE ON 24-IN. GAUGE 20-LB. RAIL  
DELIVERING MATERIAL

## ROAD FILLS PUDDLED BY PONDING

How Fills on California Highways Are Settled  
Rapidly—Holes Extend Through Fills

**T**HE ponding method of settling road fills has been successfully used in California. By obtaining complete settlement of the fill before the pavement is laid the danger of cracks in the road surface is minimized. Care must be taken, however, with heavy clay or adobe soil not to use an excess of water as a spongy condition may develop which will prevent satisfactory rolling and finishing of the subgrade. Particular care must be observed when puddling is done late in the season.

The method used in California is to construct earth dikes about 12 in. high along both shoulders of the fill. Cross dikes of the same height are then made at intervals

of from 6 to 10 ft. The top of the fill is thus divided into rectangular ponding areas approximately 24 ft. wide, and varying in length according to the grade of the road. The length of the ponding areas may be kept constant by varying the height of the dikes.

Holes extending through the fill are made with a posthole digger in each ponding area. Water is then applied until the ponding areas are filled to within 2 in. of the top of the lowest dike. The holes aid in distributing the water uniformly through the fill, aiding uniform settlement. The areas are refilled with water two or three times, or until settlement appears to have ceased.



SETTLING FILLS BY PONDING



## How Some Manufacturers Help Contractors in the Efficient Operation of Machinery—Aid in Estimating

*Modern construction service is a matter of close cooperation between the producer and the user. Machinery in operation is the only equipment that is turning out work. Fit the machine to the job and keep it in a mechanically perfect condition. Manufacturers are glad to help you. Read this story of what some men are doing.*

**T**HE letter and telegram below illustrate the fact that the maxim of some manufacturers of construction machinery is, "A machine is not sold unless it fits the job, operates successfully and a repeat order placed." This calls for true construction service to the contractor.

### LETTER

Mr. Hugh Williams, Vice-President,  
Washington Manufacturing Co.,  
New York City.

Dear Sir:

I should like to have a talk with one of your service men about the machinery required for the job I am bidding on, and have him give me his ideas as to plant requirements. When can he call to see me?

Yours truly,  
MCINTYRE CONSTRUCTION CO,  
John McIntyre, Pres.

### TELEGRAM

John McIntyre,  
McIntyre Construction Co.,  
White Falls, N. Y.:

Service man, J. S. Donovan, will call Thursday, June tenth.

### WASHINGTON MFG. CO.,

Hugh Williams.

Donovan reached the job, went over the site of the work with McIntyre, and figured the proposition from all its angles. The two men delved into overhead, salvage value, future work for the plant, and all the intricate questions that arise in contracting work. They discussed the type of plant to be used and the force required to operate it. They ate together, talked together and worked together. McIntyre was after the job to make money, and Donovan was there to help him. Incidentally, Donovan might sell McIntyre some machinery after he got the job. But whatever the outcome of the bidding, he was there to do all he could to help McIntyre.

At the end of a two days' session Donovan went back to his office, carrying with him accurate information as to what the contractor wanted and how the work could be done. He prepared an estimate of plant requirements, the number of men required to operate it, freight costs, weights, and all the other things that would

assist McIntyre in determining just exactly what it would cost him to do the job. Only that plant was recommended that Donovan knew to be suitable. With this information McIntyre submitted his bid for the work, knowing where he stood all the time. This is construction service on the estimating end.

The story is told of a contractor who happened to meet a service man of a construction machinery concern and in the course of conversation, it was suggested that he look into the possibilities of a certain job. The contractor looked over the work and decided that he wanted it. He had two days in which to get all his information and submit his bid. With the assistance of a service man, who was on the job at the first call of the contractor, estimates were made, and while the contractor was figuring the financial end of the work, the service man was working on his bid. The contractor's bid was in 5 min. before noon when bids closed. He got the job. This is another case of construction service.

"I need 300 lights to take care of the night work we are about to do on this depot," said the construction quartermaster of an army supply depot under construction near Boston. "How soon can you get them for me?"

"Within three days," replied the service man who had been called to the job by telegram.

At that time the service man did not know where 50 lights were, not to mention 300. Telegrams sent all over the country located the lights. At the end of three days the lights were on the job.

#### SECURING EFFICIENT OPERATION

One of the main advantages of manufacturers' service is the fact that their men know their equipment thoroughly, much better than any operator employed by the contractor can possibly hope to know it under ordinary conditions. But some manufacturers seek to teach these men the details and new points of operating their equipment. They arouse their enthusiasm and thereby obtain more efficient operation.

One concern, immediately after a plant is sold, telegraphs to the buyer, asking the best way and the best time for its instructor to get on the job. When the instructor arrives he at once begins to assist the contractor in training men to operate the machinery. As soon as the men are capable of taking over the job entirely, the instructor leaves. This is a very common practice in the installation of larger units of construction machinery.

But construction service does not stop at this point. The name of the operator is known to the manufacturer, and by personal letters and other means, the operator is encouraged to make the most of his machine.

In some cases prizes are offered by manu-

facturers for the most efficient work that is done, the fastest operating, the greatest economy of fuel and the best piece of work finished. These prizes frequently are offered to the man making the best record in each state.

A story is told of a contractor who was "up against it" on a road job. His rollers had no power, his mixers did not mix and the finished job was a fright. Something was wrong and radically wrong with each piece of machinery, according to the tales of the men.

A hurry-up call was sent by the contractor to the manufacturer and a service man was hurried to the job. This service man not only knew the machinery, but he was a contractor old in the game and he knew men. A few days on the job and a few suggestions as to the rearrangement of the working crew solved the problem. There was nothing wrong with the machinery, the operators needed assistance.

#### PROVIDING THE USER WITH SKILLED LABOR

"Where can I get a man who knows this machine and how to operate it? It is simple enough, but I would rather have a man who understands it." The contractor was in a hurry to begin his work.

The service man leaned back in his chair and pointed to a state map. "Do you see those blue tacks with names on them?" he said. "Each one is the home address of a skilled operator we know. Here are 20 men within a radius of 100 miles of your job who can do the work."

"Give me a few of their names," said the contractor.

Within a day he had secured his operator.

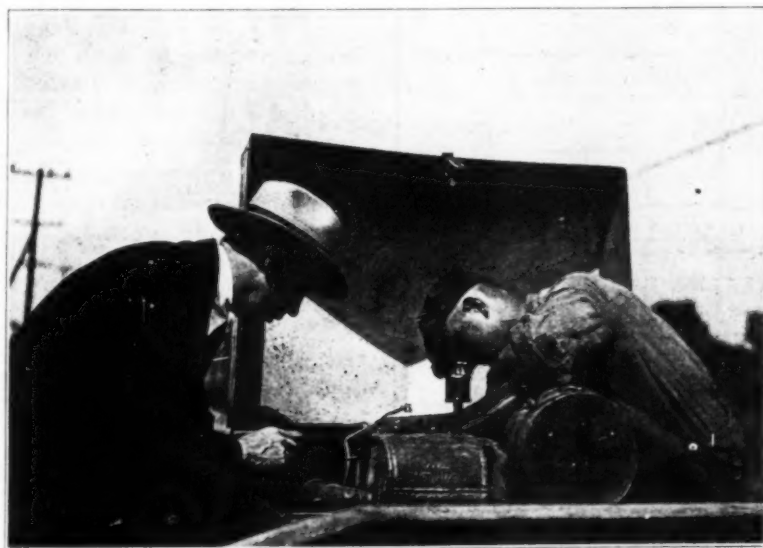
When a machine is sold a white tack is placed on the location where the machine will be operated. A red tack replaces the white one when the machine arrives on the job. The location of operators and skilled labor is marked as indicated.

#### REPAIR PART SERVICE INVALUABLE

"I always buy the same road graders," said one highway official, "because I know that I can always get repair parts and get them quickly." One of the secrets of the wide sale and remarkable efficiency of a certain make of light automobile is the fact that repair parts are easily obtained at any place and time. The same

is true of construction machinery, and this is one of the most efficient forms of service.

One manufacturer sends out a box of spare parts with each machine. To each one of these parts is attached a card with the printed directions, "When you use this part, mail this card." This serves as a notice to the manufacturer to replace the spare part and it is shipped immediately. This kind of service keeps machines in operation continuously.



TALKING IT OVER WITH THE OPERATOR





The quantity and value of parts and material on hand is recorded in such a way that the warehouse superintendent of the concern operating the plant can tell at any time the exact amount of any article on the shelves and has at his finger tips a perpetual inventory. When a card shows the supply has been reduced below a specified low limited figure, a new supply is ordered. The card shows where each piece of equipment is working at a given moment, and the value of the equipment. When a machine is transferred from one job to another a card follows it. Each piece of equipment is charged to some item of the work and the estimated depreciation in value is noted.

[illegible]

CARD USED IN KEEPING TRACK OF ORDERS AND USAGE

## MOTOR CAR FEES FOR HIGHWAYS

More Than 6,000,000 Cars Registered in United States Last Year Paid \$51,000,000 in Fees  
All But 9% of Which Was Used for Highway Work

THE "Detour" sign that sends a motorist a mile or so out of his way in order to avoid a stretch of road which is being repaired usually is looked upon with vexation. In the inconvenience of the moment the motorist forgets that in a few weeks he will heave a sigh of relief and pleasure when he strikes that newly built surface.

It is the same story with the registration and license fees paid into the state treasuries every year by automobile owners. The natural repugnance to paying out hard earned money prevents the car owner from looking ahead to discover what the state does with his enforced contribution. Yet that stretch of road, first with its "Detour" sign, and later with its smooth surface, is the final repository of his money.

The figures of 1918 show that 6,146,617 motor cars and commercial vehicles and 240,564 motorcycles were registered in the United States. They paid in fees the sum of \$51,477,416.61. These figures omit about 107,000 automobiles and motor trucks made for the United States Government during 1918, most of which paid no registration fee. These statistics show an increase of 19% in the number of cars and 27% in the revenues.

Of the \$51,477,416.61 paid in for motor car registration and license fees last year, \$46,935,691, or nearly 91% was devoted to work on highways and bridges, and about 77% of the total was expended under the direct supervision of state highway departments. The 9% which did not go into the roads was used for buying license plates and carrying on the work of enforcing the motor vehicle registration laws.

But the \$46,000,000 furnished by the motorists is only a part—although by no means an inconsiderable one—of the total sum devoted to the building and maintenance of highways. The relation of the \$46,000,000 to the total is shown on the accompanying chart which covers a period of 12 years and also includes the estimated figures for 1919. The curve of total expenditure is at least keeping pace with the other two curves which kept on going up even through the war period.

The different states have adopted varying methods for distributing the money collected for motor car registration, but the general tendency is to let the state highway departments control the expenditure of these funds instead of allowing each locality to get its share and use it in any way that the local officials see fit. This tendency makes for uniformity in road building, and renders possible the increased use of modern roadmaking machinery.

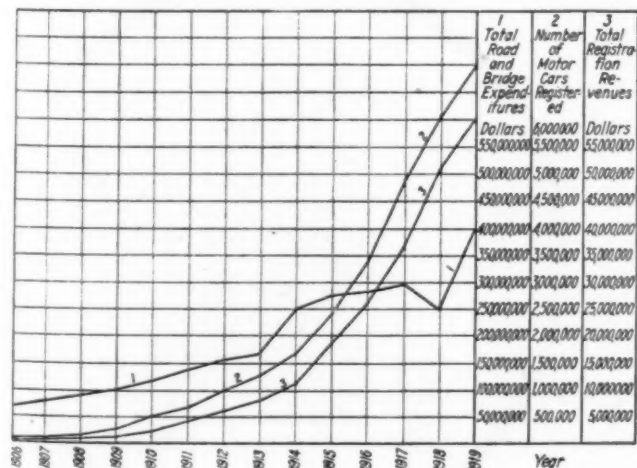
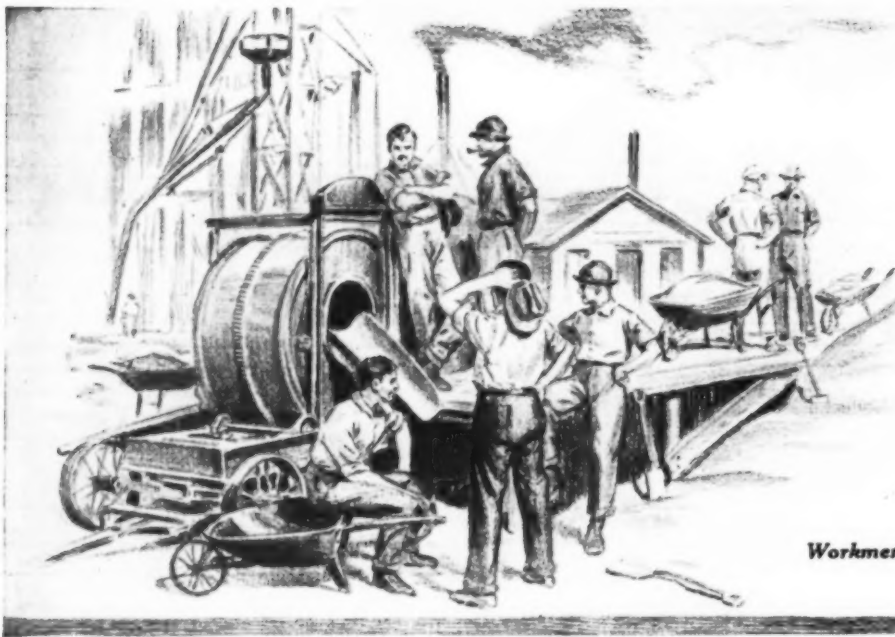


CHART SHOWING RELATION AMOUNT PAID IN MOTOR  
CAR REGISTRATION FEES BEARS TO TOTAL AMOUNT  
EXPENDED FOR HIGHWAY IMPROVEMENT



Workmen idle—job tied up—the penalty of using  
a poor engine.

## It's the Idle Time That Costs

WHEN your machinery is working, it's making money for you — otherwise you wouldn't have it.

*It's the idle time that costs* — the time lost when a breakdown ties up machinery, men and job. That's when you know that the first cost doesn't count; then's when the best is cheap at any price.

### Cook Engines are Delay Insurance

The best heavy machinery is Cook Engine driven. Look for these engines always.

They are constructed for heavy-duty service. They can break down, of course, but seldom do. And on these rare occasions their construction makes repairing simple.

### Make a Study of Engines

We urge you to study engine performance—to learn the facts for yourself. We'll send you Cook facts on request.

A study will lead you surely to specify Cook. And this, in turn, means freedom from engine trouble and low upkeep, and absence of delays.

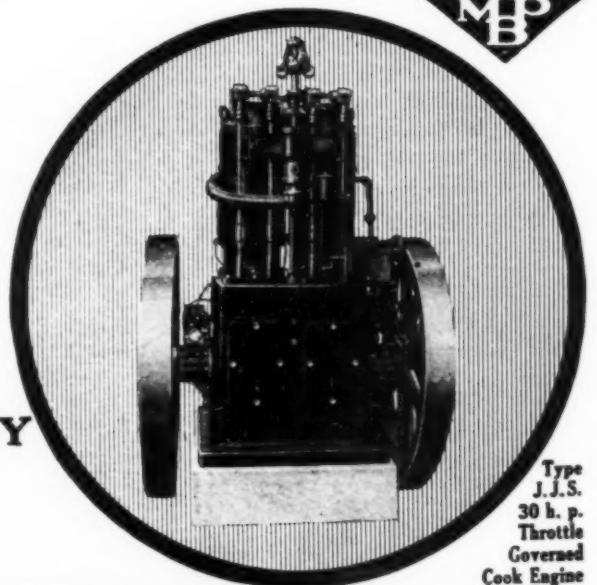
Ask us for the facts now, if you please.

**THE COOK MOTOR COMPANY**  
DELAWARE, OHIO, U. S. A.

EXPORT DEPARTMENT  
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA  
31 CHAMBERS ST., NEW YORK, U. S. A. CABLES ALMACOA NEW YORK

### Note These Cook Features:

- High Tension Magneto
- Forced Feed Lubrication — only one place to oil
- Hammer-Forged Open Hearth Steel Crankshaft
- Cut Steel Gears
- Genuine Babbitt Phosphor Bronze Bearings Throughout
- Adjustment Feature for all important bearings to take up wear, etc., etc.



Type  
J.J.S.  
30 h. p.  
Throttle  
Governed  
Cook Engine



# Cooperative Service to the Buyer for Export

¶ The export business of the non-competing manufacturers whose advertising appears in this magazine is handled by the Allied Machinery Company of America.

¶ Each of these manufacturers maintains independently throughout the United States an effective sales engineering and repair service. It is impracticable, however, for any of them to give such service abroad. At the same time, overseas users of this kind of American machinery have much more need for help from the manufacturer, due to various conditions.

¶ In the first place, delays in delivery multiply as the distance from the factory increases. This makes it necessary to carry local stocks of new machinery and repairs. In fact, a local stock of repairs is vital.

¶ In the second place, the goods must be properly packed and shipped. For example, slight changes in design or production frequently permit more compact packing so that as much as 15% of the total cost of heavy bulk machinery is saved in ocean freight.

¶ Resident sales engineers who know how to install and operate this class of machinery also are specially necessary to overseas users. This is particularly true in countries where engineers do not realize the great economy that is obtained in the United States by using labor saving machinery and methods in excavation work, in mixing concrete and in many other construction and industrial operations.

## ALLIED MACHINERY COMPANY OF AMERICA

Cable Address: ALMACOA

51 Chambers Street, NEW YORK

The branch offices, affiliated companies and representatives of the Allied Machinery Company are located at the addresses given below. Stocks of machinery and repairs are carried at most of these points. Sales engineers also are available there. This service is being expanded as rapidly as conditions will permit.

Allied Machinery Company de France, 19 Rue de Rocroy,  
Paris, France—Cable Address: ALMACOA.

Allied Machinery Company of America, 43 & 36 Rue Melsens,  
Brussels, Belgium—Cable Address: ALMACOA.

Allied Machinery Company d'Italia, Via XX Settembre 12,  
Turin, Italy.—Cable Address: ALMACOA.

C. B. Watrous, Plaza de Cataluna, 8, Barcelona, Spain.

B. C. Milner, 18 Birchin Lane, Lombard Street, London, Eng.  
Cable Address: AMINTERCOR.

Allied Machinery Company of America, Obrapia 23,  
Havana, Cuba.—Cable Address: ALMACOA.

Allied Machinery Company of America, Calle Bandera, 261,  
Santiago, Chile.—Cable Address: ALMACOA.

Allied Machinery Company of America, Iquique, Chile  
Cable Address: ALMACOA.

J. A. Cordeal, Venezuela, 691, Buenos Aires, Argentina  
Cable Address: ALMACOA.

Oscar Taves & Company, 90-92 Rua Sao Pedro, Rio de  
Janeiro, Brazil.—Cable Address: ARAMPO.

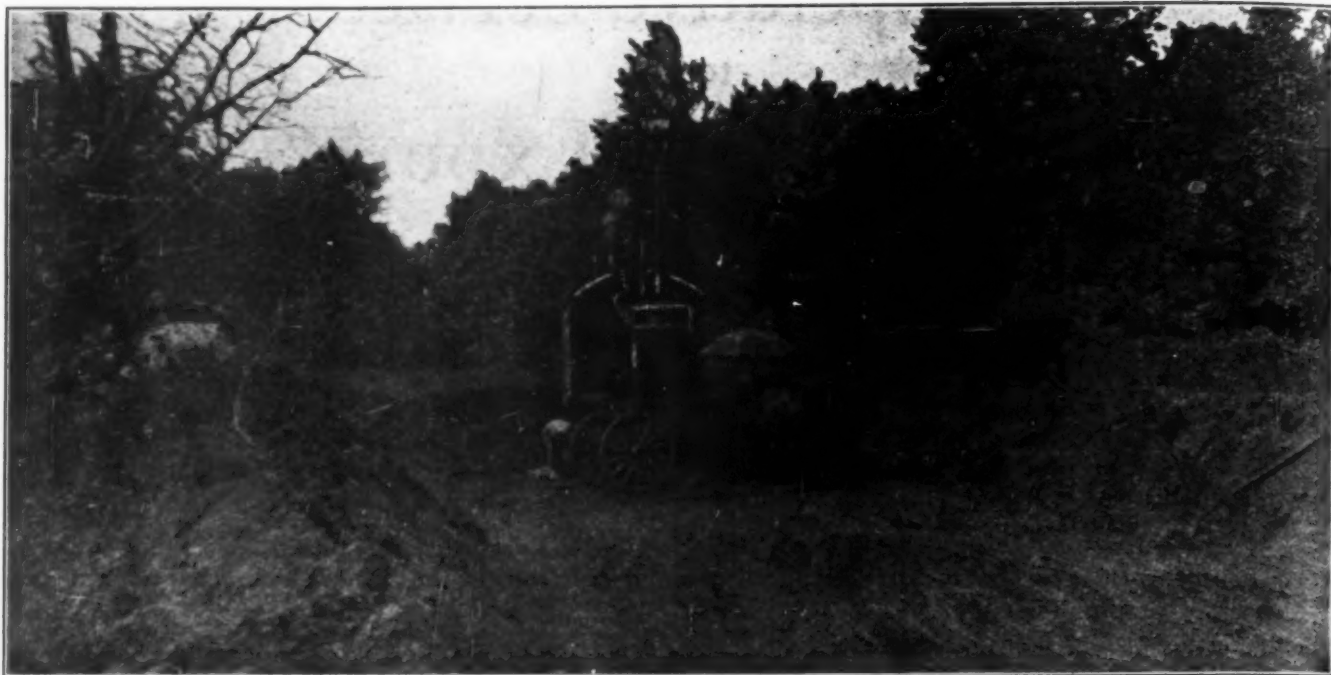
Byington & Company, Sao Paulo, Brazil  
Cable Address: ALTON.

A. N. Herrick, Vickerys Chambers, Sydney, Australia  
Cable Address: CONALMAC.

Horne Company, Ltd., 6-7 Takiyama-cho, Kyobashi-ku,  
Tokyo, Japan.—Cable Address: HORNE.

L. R. Vinall-Moon, 3, Baillie Street, Colombo, Ceylon  
Cable Address: ALMACOA.

*Thews are Everywhere*



The sooner your job is finished the sooner you get paid for it—the lower your overhead charges—and

### The Greater Your Profits

You cannot afford to delay in the excavation—it holds up the whole job—lose you time and money. Protect your profits with the proper shovel equipment.

### The Thew Keeps on Working

For a quarter of a century Thew has been eliminating the "weakest link"—more strength here—more weight there—a change in design if necessary—the sum total of our experience in building and watching nearly 2000 machines has resulted in the absolute **DEPENDABILITY** for which Thews are famous.

And with this ruggedness and dependability goes the most modern equipment for securing speed, power and efficiency.

Let us tell you of the improvements and features brought out by Thew in the last 12 months.

We manufacture a complete line of Revolving Power Shovels—Electric, Gasoline, Steam—with dipper capacities ranging from  $\frac{1}{2}$  to 2 cubic yards.

**THE THEW AUTOMATIC SHOVEL CO.,**  
LORAIN, OHIO

New York Office: 30 Church Street

**THEW Power Shovels**

ALMACOA

EXPORT DEPARTMENT  
**ALLIED MACHINERY COMPANY OF AMERICA**  
51 CHAMBERS ST., NEW YORK, U.S.A. CABLES: ALMACOA NEW YORK

ALMACOA

## Carbic Portable Lights Contribute to the Success of Many Big Construction Jobs



CARBIC Portable lights have given continuously good service on many a big job of construction work. The large contracting firms using them—in many cases exclusively—give full credit to Carbics for their aid in combating the conditions contingent upon night work.

CARBIC Lights, fed by the efficient use-it-to-the-atom Carbic cake, have won the unvarying favor of every contractor, big or small, who has used them. They win approval wherever they are used. This is due to many factors, two of which are SIMPLICITY and EFFICIENCY.

CARBIC cakes are made from the highest grade Calcium Carbide treated and compressed into briquet form by our special process and represent not only the most efficient and economical means of supplying gas for portable torches but also the safest.

CARBIC lights are simple to charge, simple to put together, simple to use. Just slip four Carbic Cakes into the hollow holder, put on the cap and it's ready for work. Moreover, the three simple parts can't be assembled wrongly. In this case, doesn't SIMPLICITY spell ECONOMY?

### Carbic Manufacturing Company

MAIN OFFICE AND FACTORY

NEW YORK	DULUTH	CHICAGO
52 Vanderbilt Ave.		111 W. Washington Street
BOSTON		PITTSBURGH
27 School St.		101-109 Galveston Ave. North
PHILADELPHIA		CLEVELAND
18 S. 7th St.		619 Guardian Bldg.

Warehouses and Representatives in Other Principal Cities



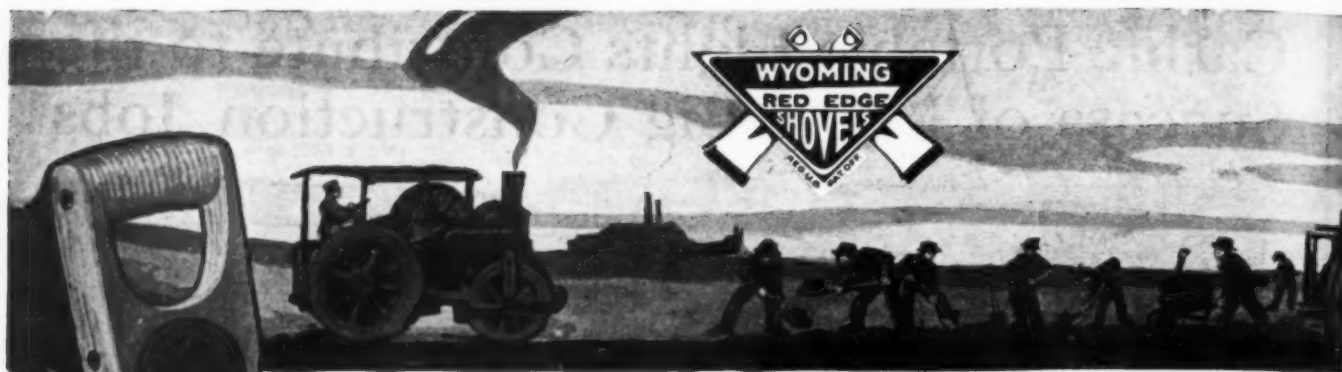
**FOR LIGHTING—WELDING—CUTTING**

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# How Much Do Your

## Give Some Thought To Hand Shovels

**P**LEASE remember this: The hand shovel that you never give a thought is the most necessary and most neglected tool on any construction job.

A startling fact, isn't it? Quite enough to make you sit up and start thinking hand shovels.

### Ask Yourself These Questions

What make do your men use? What kind of shovel is it anyway? Does it hang right — how's the balance? Is it doing a full day's work every day or does it slow up the job because it is hard to swing?

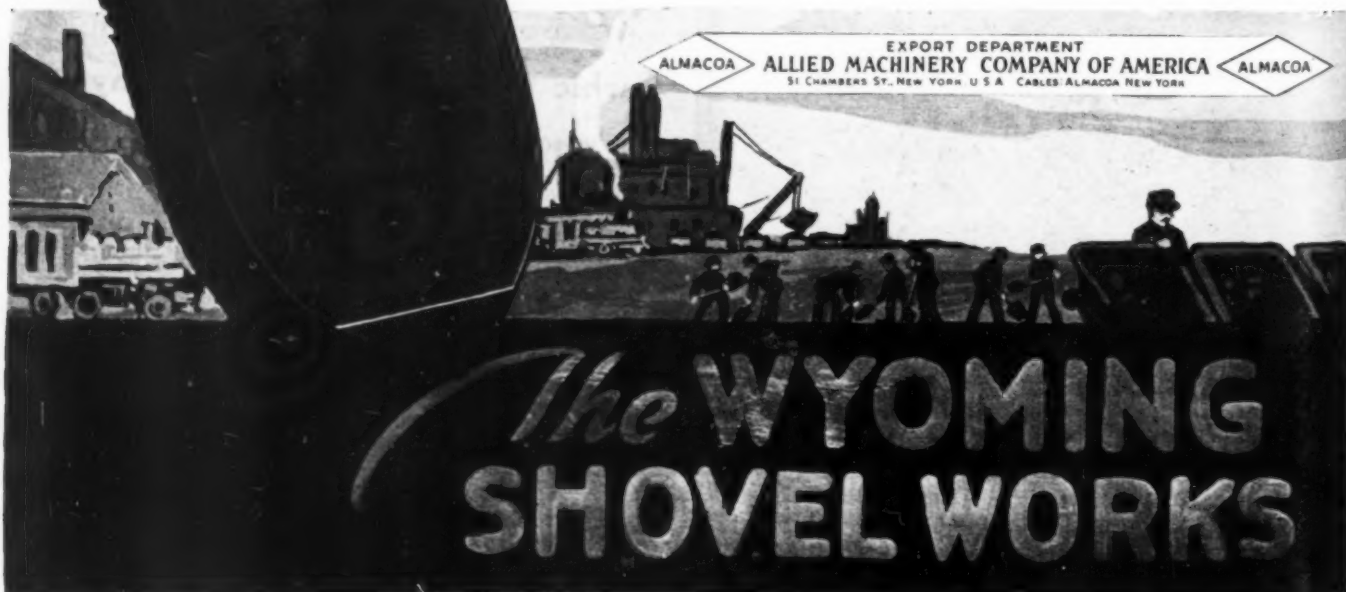
These are just a few of the facts you should have about hand shovels. We'll gladly give you the answers to these and all the others.

We want you to have the facts — and we think you want them. When shall we send them?

**The Wyoming Shovel Works, Wyoming, Pa.**

*The Red Edge  
Shovel*

*Marked for  
your protection*





# Shovels Really Cost?

## Figure Their Cost This Way

**D**ID you ever stop to compare the mammoth steam shovel with the common hand shovel? One costs nearly \$10,000—sometimes even more. The others \$2 or less.

One you purchase carefully—with great thought and investigation as is befitting so costly a purchase. The other—you're careless when it comes to that! Isn't it so?

A steam shovel is operated by a \$6 or \$7 per day man. A hand shovel wielder draws \$4 to \$5 these days. So your labor cost—always the greatest cost—isn't so far greater for one than for the other.

## Look for the Red Edge

Consider these facts and you'll consider hand shovels—give more than a passing thought to their purchase.

That's all we want! When you get all the shovel facts—you'll specify Wyoming Shovels—the red edge shovels.

The red edge marks the best in hand shovels. It's your buying safeguard. We'll tell you why. Ask for shovel facts.

**The Wyoming Shovel Works, Wyoming, Pa.**

*The Red Edge  
Shovel*

*Marked for  
your protection*

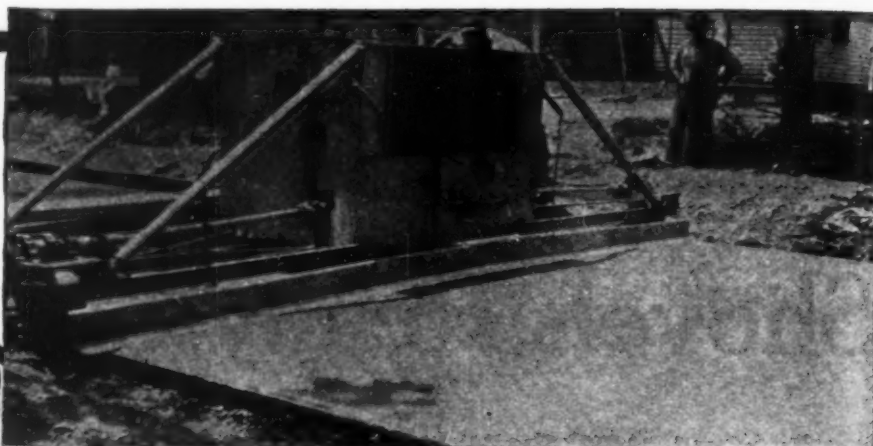
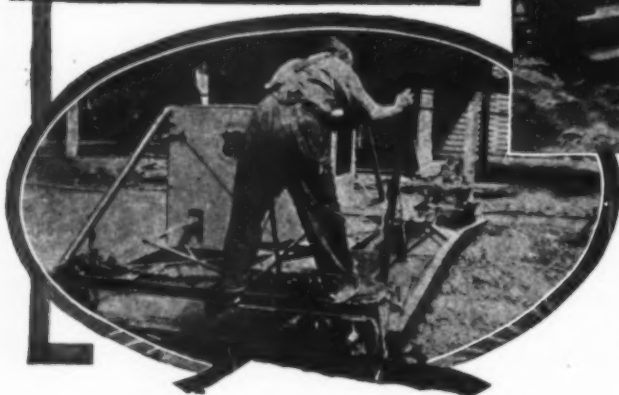


# The WYOMING SHOVEL WORKS





The illustrations show one of the two Lakewood Concrete Road Finishers used on the Belleville-Shiloh Road in St. Clair County, Ill. The first machine was purchased by Keely Bros., Contractors, of East St. Louis. After it had been in use several weeks the County purchased a second one.



Get the Facts About This

## Lakewood Concrete Road Finisher

It automatically spreads, tamps and finishes the concrete.

A member called the strike-off spreads the concrete to the necessary height and crown. The tamping member subjects the concrete to continuous agitation, removes the voids and brings the surface to the exact height and crown. A belt, at the rear, finishes the surface.

One man, with the Lakewood Finisher and two helpers, can do the work usually done by 8 or 9 men when working dry concrete.

A coarser, drier mixture can be used and a stronger, denser concrete results.

*Send for Bulletin 28-B—It Gives Complete Information*

THE LAKEWOOD ENGINEERING CO.  
CLEVELAND, U. S. A.

Offices in New York, Boston, Philadelphia, Washington,  
Pittsburgh, Detroit, Chicago, Milwaukee, Salt Lake City,  
Los Angeles, Seattle, Oklahoma City, Kansas City and Houston

# Lakewood Road Com

ALMACOA

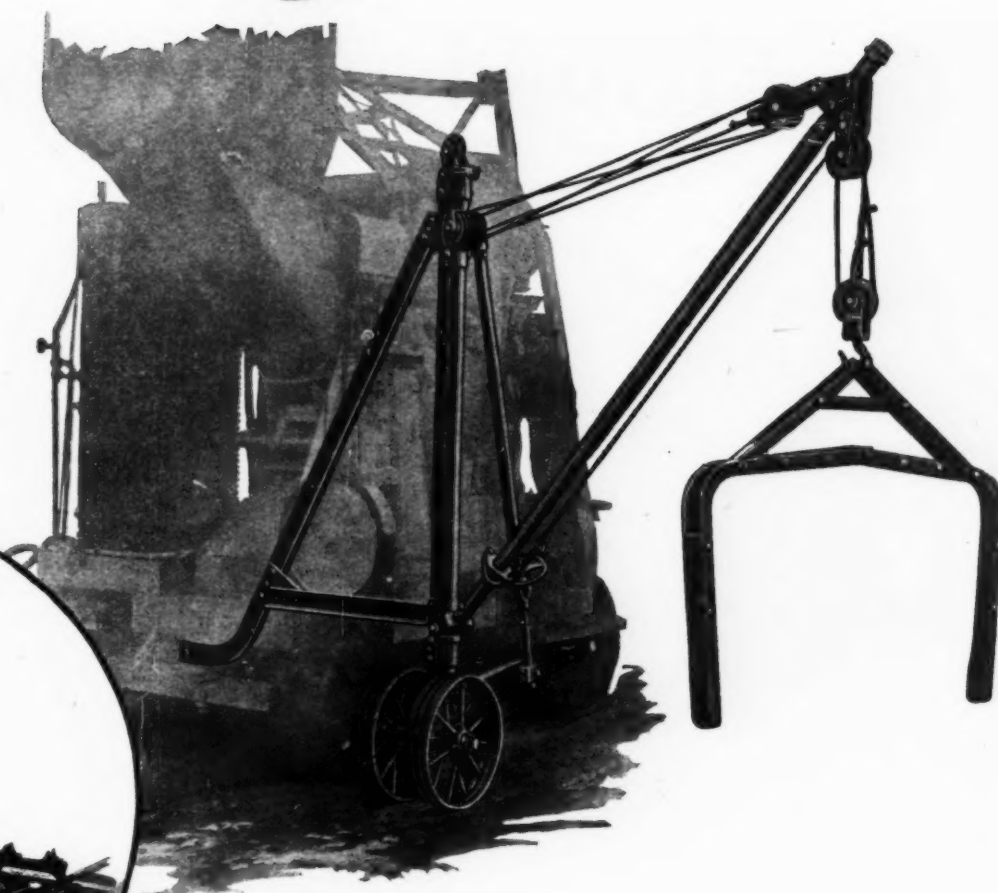
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Bulletin 29 tells how the Lakewood Road Construction system cuts costs and doubles the working season. Have you a copy?



## The Lakewood Batch Transfer

(The Weight of the Skip Is the Lifting Force)

By means of the Batch Transfer on Lakewood Paving Mixers, Lakewood Road Cars, filled with complete batches, are dumped directly into the charging skip. The weight of the descending skip lifts the car full of aggregate from the running gear. Thus no extra power is required to operate the derrick. The device is applied to either side of the paver.

THE LAKEWOOD ENGINEERING CO.  
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Offices in New York, Boston, Philadelphia, Washington, Pittsburgh, Detroit, Chicago, Milwaukee, Salt Lake City, Los Angeles, Seattle, Oklahoma City, Kansas City and Houston

# Construction Plant

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# How Lakewood Keeps

The Lakewood method of charging the mixer is one of the big reasons why the Lakewood system for constructing concrete roads is causing so much favorable comment by contractors and engineers.

Lakewood Road Cars are filled with properly proportioned batches at a central loading plant and hauled to the mixer.

This eliminates stock piles on the grade. Cuts the cost of caring for cement sacks. Eliminates big wheelbarrow crews. Assures clean aggregates. Avoids waste of materials.



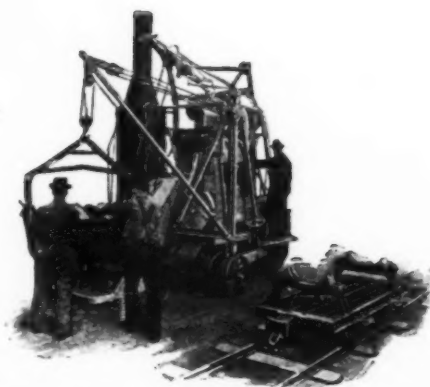
Cars carrying complete batches arrive at mixer. Cover of cement box is removed. Bail is attached to car body.



Mixing operator lowers skip. Weight of skip raises car body from running gear. Thus no extra power is required.

*The operation of Lakewood Road Plant is described in Bulletin 29. A copy will be sent on request. In planning road plant to meet requirements Lakewood Engineers can help you. Their services are yours for the asking.*

*Send for full*



Car body holding complete properly-proportioned batch is swung over to skip by two men.

# Lakewood Road Co

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# ps the Subgrade Clean

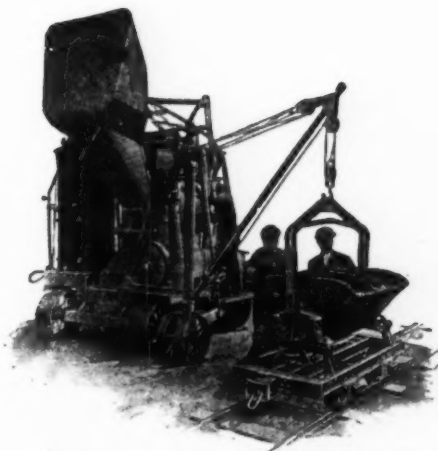
Involves no hauling over finished grade with wagons or trucks. Once finished the subgrade needs no more attention.

Concrete placing can be started as soon as grading has begun. Thus the working season is actually increased one or two months. Operation is independent of weather conditions.

The system is flexible so that it can be used on wide or narrow road. And with this system a contractor can finish 3 or 4 times as much road as in the past.

THE LAKEWOOD ENGINEERING COMPANY  
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Skip is raised and mixer charged. As skip rises car body is lowered onto running gear. Bail is detached and operations repeated.



Empty car body is righted and held upright by latch as it is swung back over running gear.



Complete batch is dumped into charging skip. Car body turns upside down, cleaning thoroughly.

# Construction Plant

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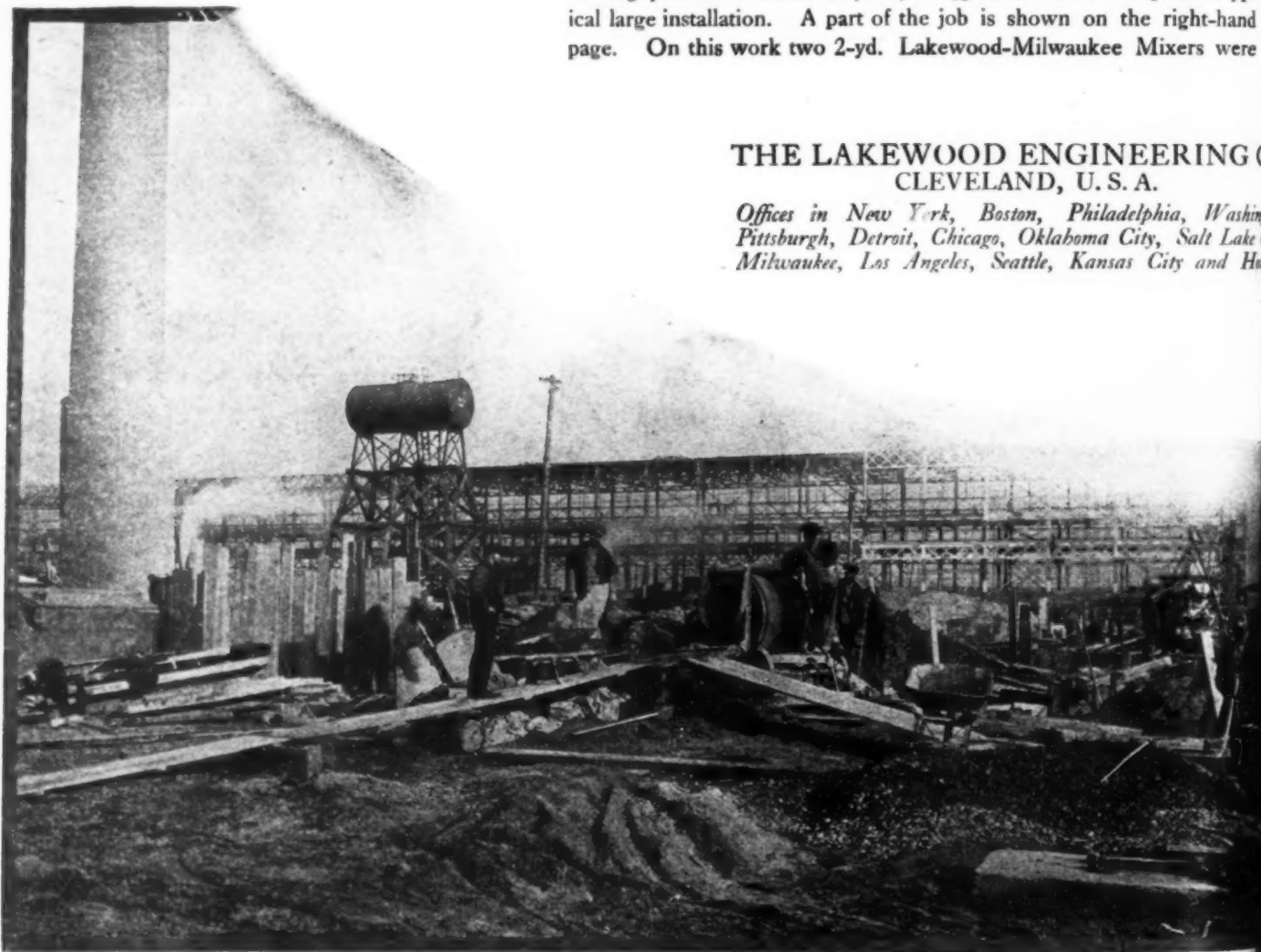




# Complete Plant for Big

For pier foundations and other work where small volumes of concrete were spread over a large area, the Hugh-Nawn Contracting Company, Boston, used a Lakewood Universal Mixer. The picture is of the work at Camden, N. J., for the South Yard, New York Shipbuilding Co.

The Lakewood Plant used by E. W. Sproul, General Contractor, Chicago, to construct the \$3,000,000 Quartermaster's Depot is a typical large installation. A part of the job is shown on the right-hand page. On this work two 2-yd. Lakewood-Milwaukee Mixers were



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# Lakewood Const

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# Big Jobs and Small Ones

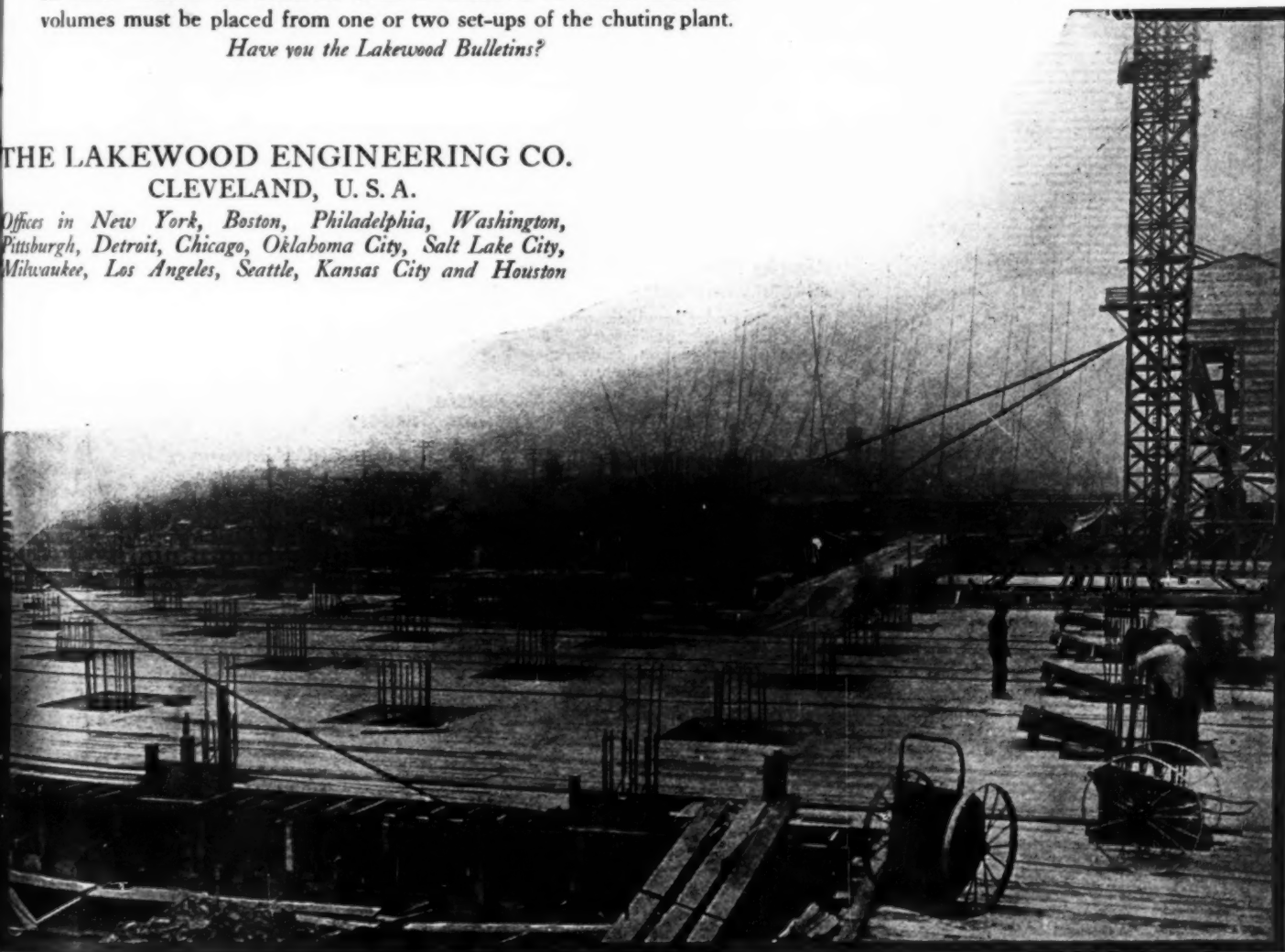
used as well as Lakewood Chuting Plant, Concrete Carts, Floor Hoppers, etc. This six-story building occupies a ground area 325 x 600 ft. Over 62,000 cu. yds. of concrete were required, most of which was placed at the rate of 240 yds. an hour.

These two jobs illustrate the completeness of Lakewood service to the construction field. The Lakewood line includes plant for jobs of all sizes—where the concrete work is scattered or where immense volumes must be placed from one or two set-ups of the chuting plant.

*Have you the Lakewood Bulletins?*

THE LAKEWOOD ENGINEERING CO.  
CLEVELAND, U. S. A.

Offices in New York, Boston, Philadelphia, Washington, Pittsburgh, Detroit, Chicago, Oklahoma City, Salt Lake City, Milwaukee, Los Angeles, Seattle, Kansas City and Houston



# Construction Plant

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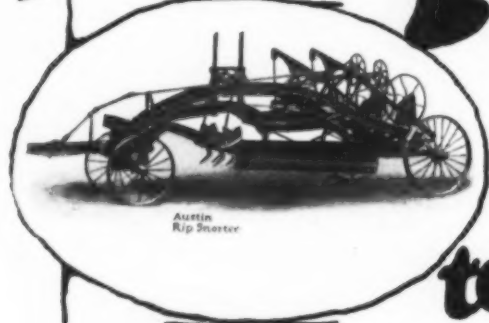
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Austin

# 11 Austin Units in 5 Days to 5 Chicago Contractors

Austin  
Rip Snorter

Five representative Chicago contractors—Jas. O. Heyworth, Bates & Rogers Construction Co., Mellon, Stewart, Nelson Co., The Embankment Co., and the Powers-Thompson Co., purchased 11 pieces of Austin equipment within a five day period—six Austin 10-Ton Motor Rollers, two Giant Graders, one Steerable Scarifier and two Rip Snorters.

These selections represent the judgment of men who have devoted the best portion of their lives to road and street building.

Their choice is sufficient evidence of the years of satisfactory service we build into Austin Equipment.

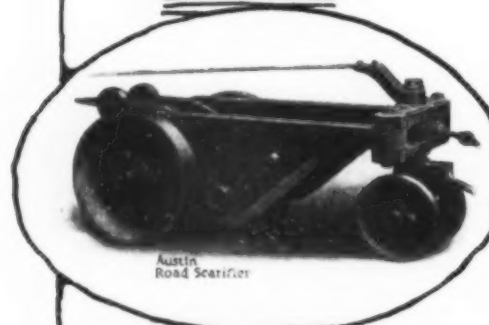
We will gladly mail catalogs to dealers or contractors upon request; stating the specific road or street equipment in which they are interested. Write us.

## Austin 10-Ton Motor Rollers

A powerful road roller with heavy duty motor. Shows good performance under severe service conditions. Easy to control and can get in and out any place.

## Austin Rip Snorter

Rips and regrades in a single operation ready for rolling. A powerful scarifier and efficient grader combined.

Austin  
Road Scarifier

## Austin Road Scarifier

An effective machine for breaking up old road surfaces. Drawn by power roller its adjustable tynes rip old macadam and gravel roads and the new material bonds perfectly with old.

## Austin Giant Grader

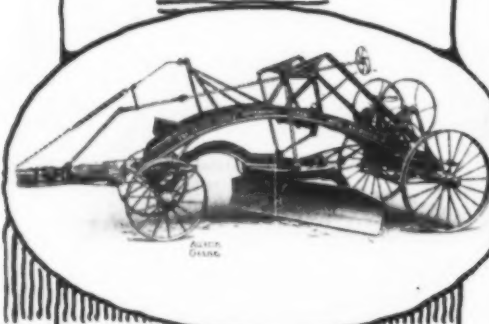
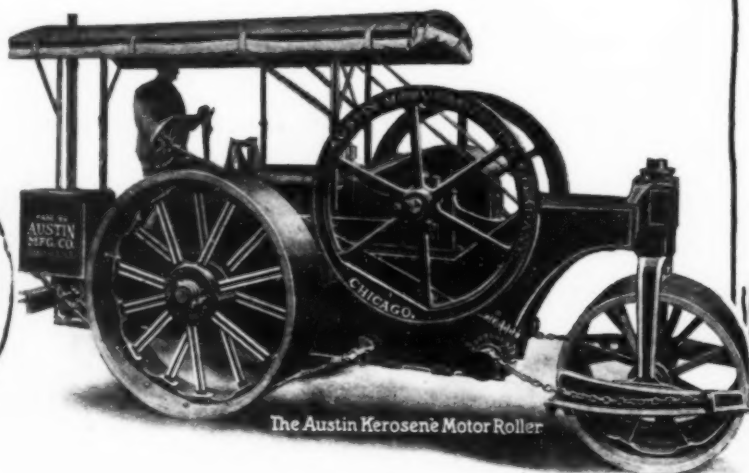
A rugged machine with the characteristic Austin arched frame, giving high blade clearance. Operating wheels and levers are carried well back to a low platform, facilitating a clear view of work.

# AUSTIN MANUFACTURING CO.

NEW YORK

CHICAGO

SAN FRANCISCO.

Austin  
Giant Grader

The Austin Kerosene Motor Roller

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# An Inside View Invites Your Study



**W**E are anxious for you to know the internal construction of the Austin Gyratory Crusher. The more you study it, the deeper you probe into the details of design, the more certainly will you become deeply convinced of the great advantages of Austin equipment.

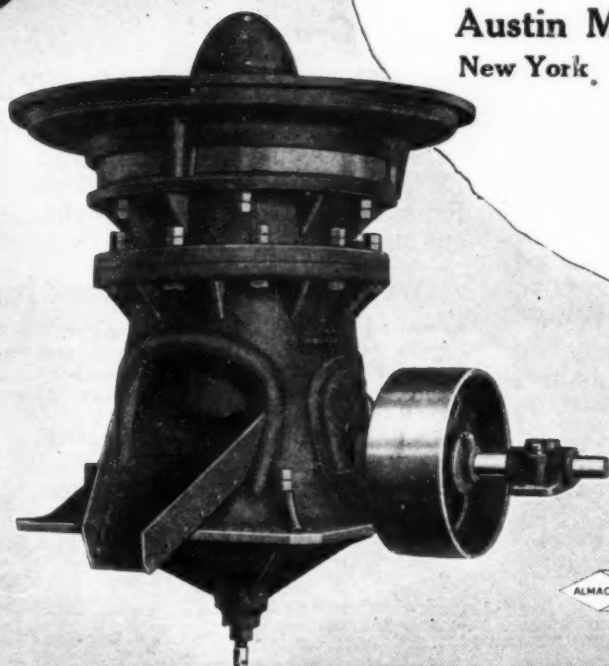
We ask you to study and learn these advantages yourself, rather than for us to explain them to you. For Austin Gyratory features are performance features — substantial mechanical advantages—not talking points.

There are eight sizes ranging from 5 to 500 tons hourly capacity. Literature describing each model in detail ready for you. Send today.

Austin Quarry and Gravel Pit Equipment also includes Revolving Screens, Belt and Chain Elevators, Quarry Cars and Hoists, etc.

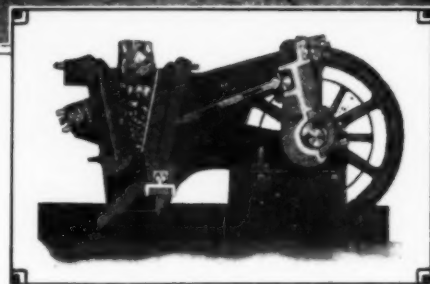
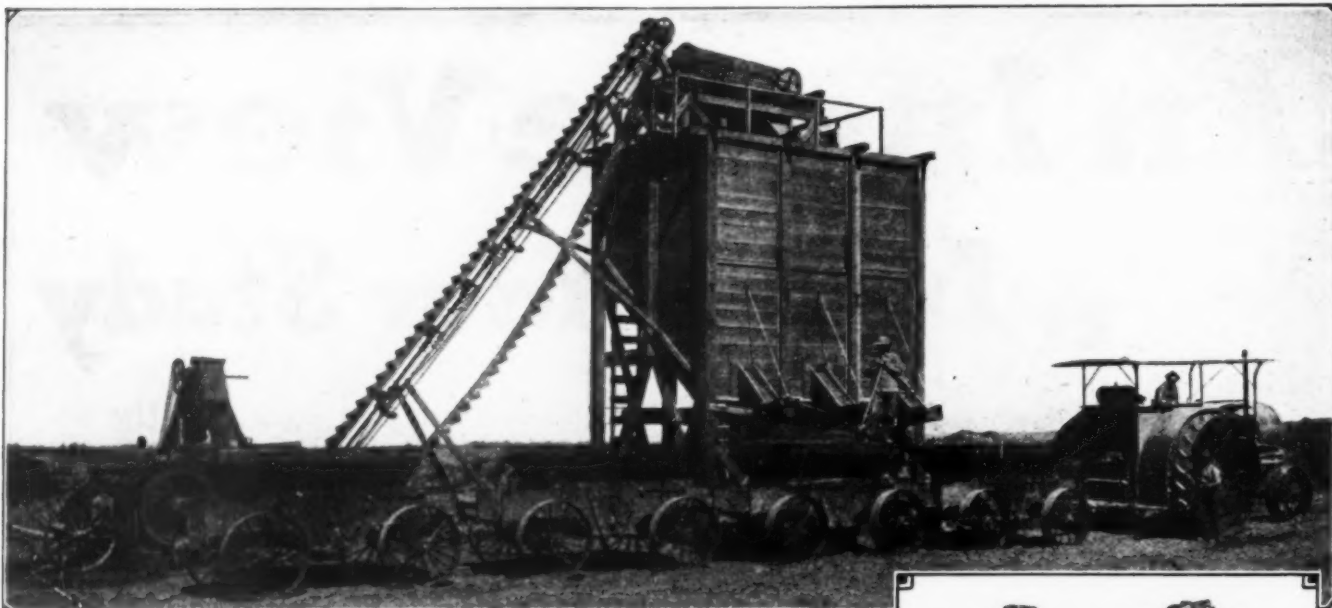


**Austin Manufacturing Company**  
New York, CHICAGO San Francisco



During the war the United States and Allied Governments purchased over 700 Austin Motor Rollers, more than ten times their combined purchases of all other rollers and at higher prices.

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Sectional View of Aurora Crusher

## The Double-Blow Stroke What It Means In Crushing Rock

A TWO-BLOW stroke to each revolution of the crankshaft—*double* the blows on the stone delivered by any other make—that's the big feature for you in the Aurora Crusher.

Think what this feature means. Think of the advantages it gives the Aurora over any other Crusher.

# The Aurora Rock Crusher

*"The Two-Blow Stroke Crusher"*

Here are three advantages of the "double-blow." Note them carefully. Each is of vast importance to you.

The Aurora turns out more tonnage per horse power than any other jaw crusher.

It has overcome the basic objection to the jaw crushers—and only the Aurora has conquered here. Ordinary jaw crushers only do effective crushing 50% of each revolution. The Aurora is effective 100% of the time.

The "two-blow stroke" balances and equalizes the strain, thus reducing the vibration on the machine.

### Crusher Facts for You

We have compiled some interesting matter on crushers which you should have. It's yours for the asking—send for it at once.

Estimates covering your needs submitted without obligation.

### Aurora Rock Equipment Includes:

Revolving Screens	Folding Portable Elevators
Standard Elevators	Stationary and Portable Bins
Gravel Feeding Attachment to Crusher	
Dumping Hoppers to Feed Elevators	
Gravel Screening Plants	
Portable Track and Quarry Cars, etc., etc.	

### The Austin-Western Road Machinery Company, Chicago

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Columbus, Ohio  
St. Paul, Minn.

Portland, Ore.  
San Francisco, Calif.  
Los Angeles, Calif.  
Boston, Mass.

Philadelphia, Pa.  
Charleston, W. Va.  
Dallas, Texas.  
Atlanta, Ga.

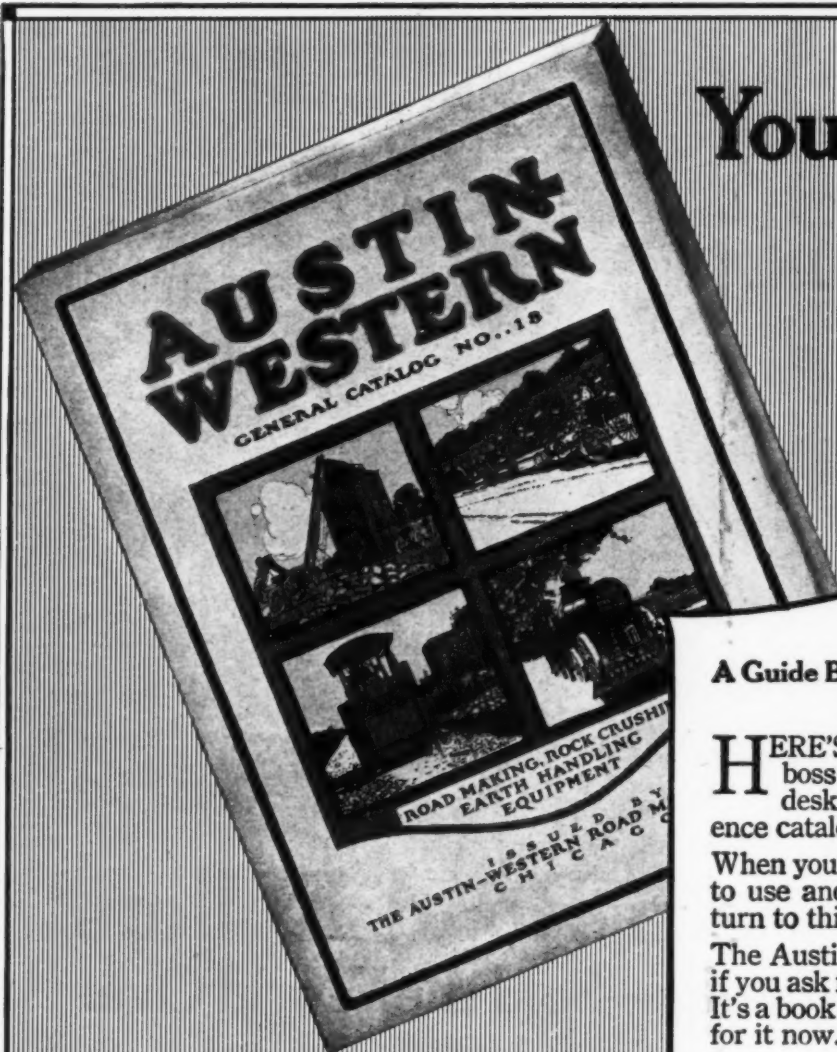
Jackson, Miss.  
Memphis, Tenn.  
Nashville, Tenn.  
Richmond, Va.

Oklahoma, City, Okla.  
Louisville, Ky.  
New Orleans, La.



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# You Need This Handy Reference Book

**A Guide Book of Road Building Equipment  
—for your desk**

**H**ERE'S a book every contractor and road boss wants and needs right on his desk—a big, handsome, handy reference catalog of road building equipment.

When you want to know what kind of tools to use and where to get them quick, just turn to this complete guide book beside you.

The Austin-Western Catalog is free to you if you ask for it on your business letterhead. It's a book you want—and need. Better send for it now. Ask for General Catalog No. 18.

## Austin-Western Road Machinery

A tool for every job. Our line of Road Graders includes every size from our little two-horse Midget (1000 lb. weight) to the great No. 10 traction grader (over 7000 lbs. weight), the latter guaranteed to stand the heaviest tractor pull and do the work of two or three ordinary graders.

## Austin-Western Municipal Line

Austin Motor Sweepers—sweep and pick up the dirt at one traverse.

Austin Sprinkler-Sweepers—the best combination for horse operation.

Austin Road Oilers (with and without heaters), in styles for both horse and motor hauling.

All shown in big catalog. Send for it at once.

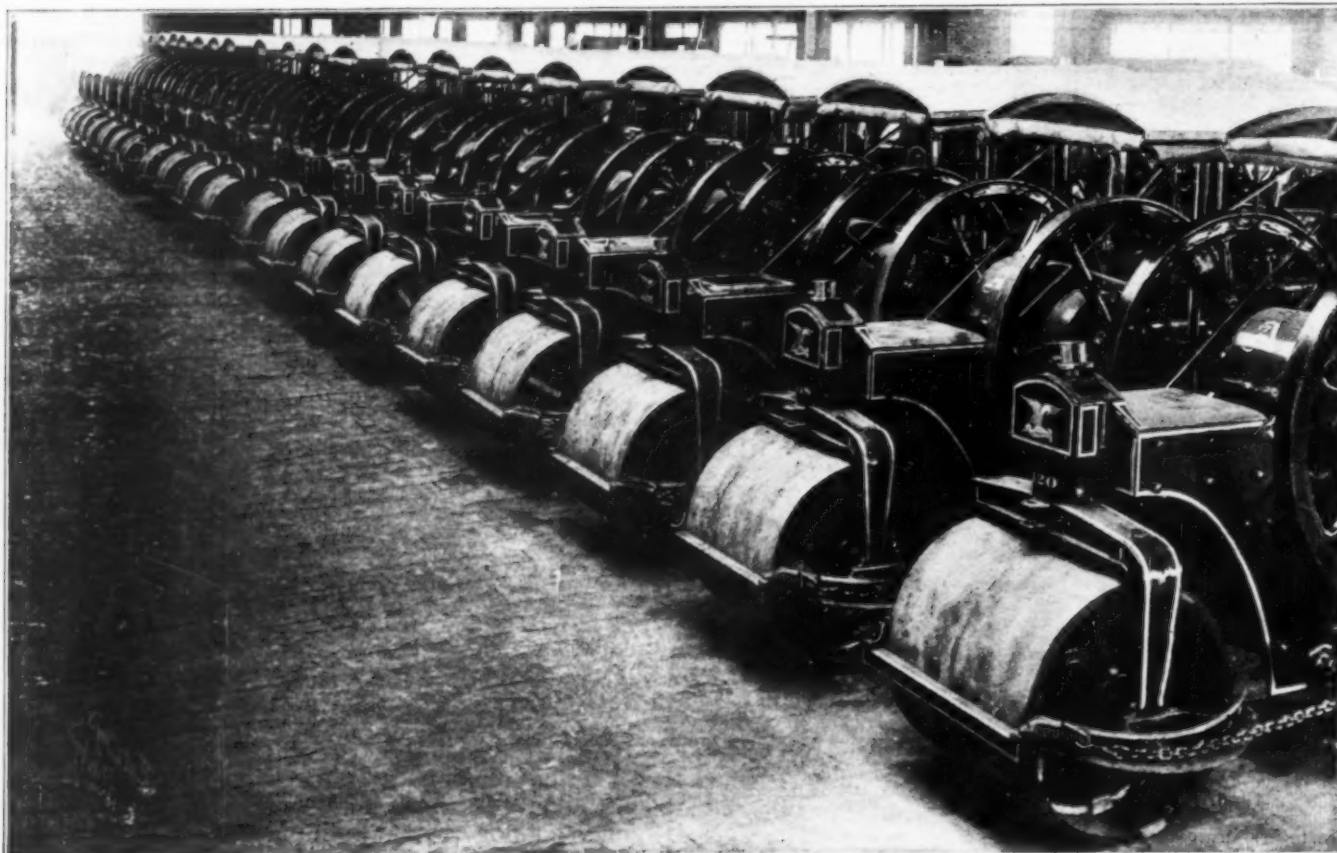
**The Austin-Western Road Machinery Co., Chicago**

### Branch Offices

New York City	San Francisco, Cal.	Atlanta, Ga.	Richmond, Va.
Albany, N. Y.	Los Angeles, Cal.	Jackson, Miss.	Oklahoma City
Columbus, O.	Boston, Mass.	Memphis, Tenn.	Louisville, Ky.
St. Paul, Minn.	Philadelphia, Pa.	Nashville, Tenn.	New Orleans, La.
Portland, Ore.	Dallas, Texas	Charleston, W. Va.	







## Austin-Western Road Rollers A Quantity Production—Sold the World Over

OUR large volume production of Austin-Western road machinery makes it possible for us to give real value—the full mechanical equivalent for every dollar spent on an Austin Western machine. We couple unusual distribution service with unusual values. Our 19 branch houses enable us to give prompt service to customers no matter where located.

### A Typical 1000

Please note the widespread distribution of 1000 Austin-Western 3-wheel rollers as shown below. It is the best evidence we can offer of our quantity production and universal distribution.

Alabama.....	2	Minnesota.....	18	Virginia.....	14	Java.....	5
Arizona.....	4	Mississippi.....	8	Washington.....	16	Martinique.....	2
Arkansas.....	11	Missouri.....	12	West Virginia.....	4	Morocco.....	5
California.....	123	Montana.....	4	Wisconsin.....	84	New Zealand.....	4
Connecticut.....	2	Nevada.....	1	Wyoming.....	1	Palestine.....	1
Florida.....	14	New Hampshire.....	3		601	Peru.....	1
Georgia.....	3	New Jersey.....	2	Argentina.....	3	Philippines.....	6
Idaho.....	4	New York.....	33	Canada.....	20	Porto Rico.....	14
Illinois.....	45	North Carolina.....	3	Costa Rica.....	3	Roumania.....	1
Indiana.....	7	Ohio.....	22	Cuba.....	3	Russia.....	222
Iowa.....	6	Oklahoma.....	1	Denmark.....	1	Salvador.....	1
Kansas.....	1	Oregon.....	12	France.....	83	San Domingo.....	7
Kentucky.....	6	Pennsylvania.....	20	Germany.....	1	Spain.....	3
Louisiana.....	7	South Carolina.....	2	Hawaii.....	2		399
Maryland.....	2	South Dakota.....	1	Honduras.....	1		601
Massachusetts.....	1	Tennessee.....	12	India & Sts. Settlements	10		1000
Michigan.....	40	Texas.....	50				

During the war the United States and Allied Governments purchased over 700 Austin Motor Rollers, more than ten times their combined purchases of all other rollers and at higher prices.

### The Austin-Western Road Machinery Company, Chicago

New York City  
Albany, N. Y.  
Columbus, Ohio  
St. Paul, Minn.

Portland, Ore.  
San Francisco, Calif.  
Los Angeles, Calif.  
Boston, Mass.

Philadelphia, Pa.  
Charleston, W. Va.  
Dallas, Texas  
Atlanta, Ga.

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# BIG WORK REQUIRES EFFICIENT EQUIPMENT



THE BEST  
THE  
WORLD PRODUCES  
**WESTERN**  
EARTH AND STONE  
HANDLING MACHINERY

**WHAT IS YOUR JOB?** There's a Western Dump Car to fit it. Whether it be a big contract needing big cars or a smaller job calling for smaller cars—whatever the job—use Western Dump Cars.

Steep dumping angle. Large discharge opening. Quality of workmanship and material. All these features combine in making Western Dump Cars the most profitable for you to use.

Western Dump Cars have made fame for themselves—they work fast and save in handling costs.

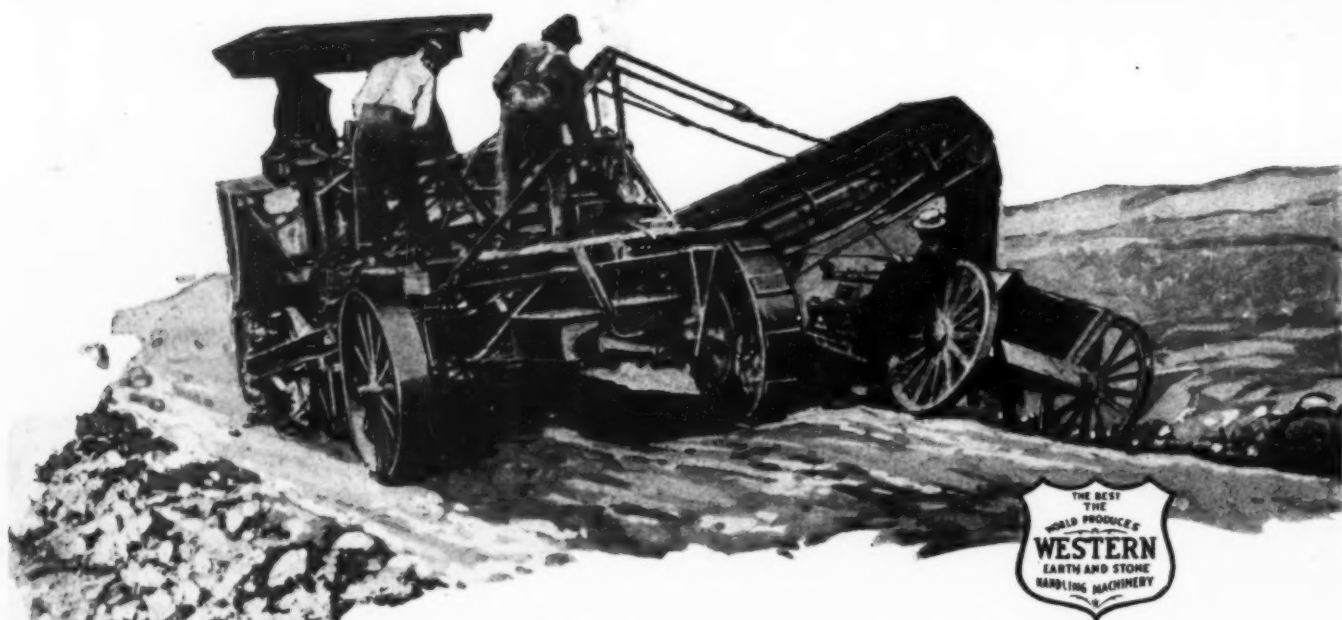
ASK US ABOUT WESTERN DUMP CARS FOR YOUR JOB

## Western Wheeled Scraper Company

EARTH AND STONE MOVING MACHINERY

### Aurora, Ill., U.S.A.

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ALLIED MACHINERY COMPANY OF AMERICA  
St. Charles St., New York, U.S.A. CHICAGO ALMA CO. NEW YORK



# Earth and Stone

Moving 1000 cubic yards a day is *usual* rather than unusual with Western Elevating Graders. On one job 165 1½-yard Western Dump Wagons were loaded in one hour.

For excavating canals, ditches, reservoirs—

For building levees and embankments—

For road grading and wagon loading—

Western Elevating Graders cut digging and loading costs to the bone and earn more money for the user.

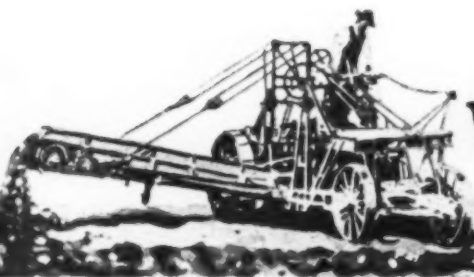
For more than 40 years the "Western" name on road-building machinery has been the contractor's guarantee of dependable and efficient operation.

Speed in getting repair parts to the job is a feature of Western service that contractors and engineers appreciate. Western warehouses in various parts of the country carry complete stocks for your convenience.

If you use a "Western" you'll never be sorry.



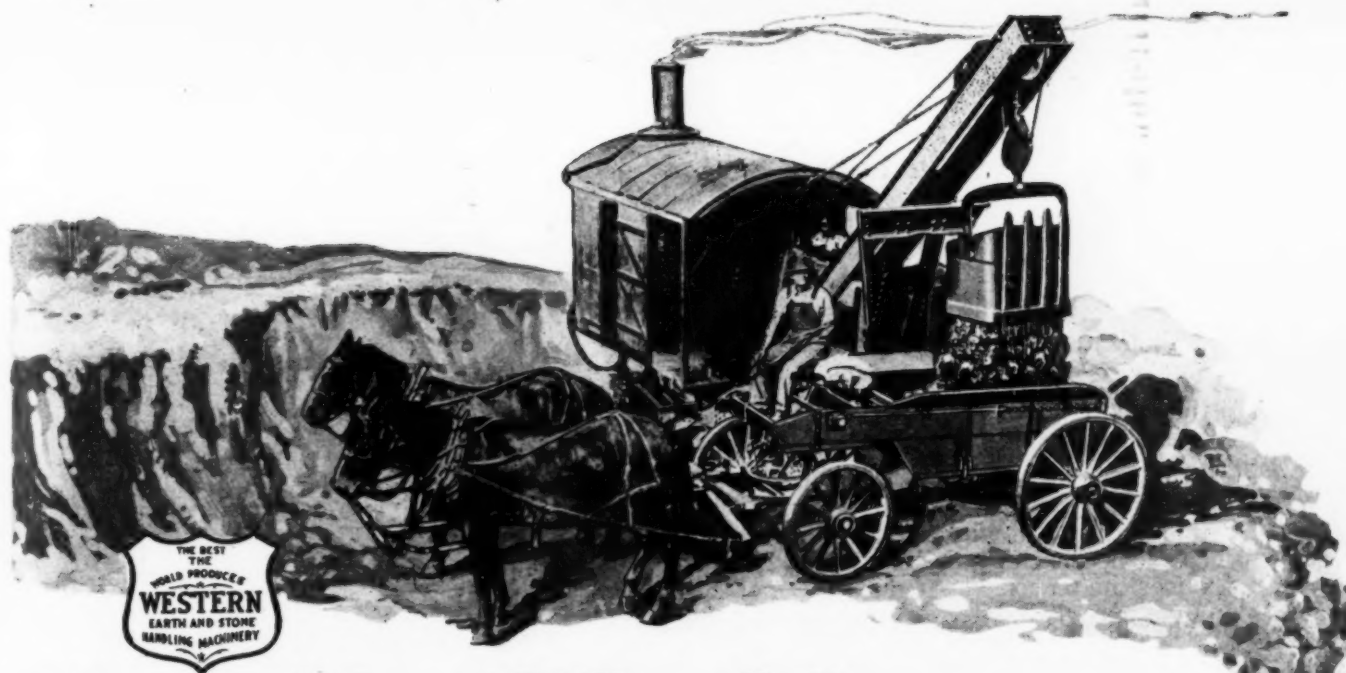
The "Western" line is shown in the attractively illustrated catalog.



## WESTERN WHEELED AURORA

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ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA  
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# Handling Machinery

The light construction and rugged strength of Western Dump Wagons—features so necessary to successful contracting—were proved conclusively in France during the war.

Trains of six  $1\frac{1}{2}$ -yard Western Dump Wagons, heavily loaded with stone for road work, pulled easily over soft ground by a small tractor, were a common sight "over there".

Such service was possible because Western Dump Wagons are strong and light and require a surprisingly small pull to haul them in trains over rough ground.

The discharge doors are easily operated by hand or foot. The load is dumped quick, and clean, without stopping the team.

These "Western" features—and the 40-year old "Western" policy of building the best—insure long, dependable, *every-day* service.

The Standard Western Dump Wagon can be used profitably to handle all kinds of material. When used with Western Elevating Graders and Wagon Loaders costs are cut to rock bottom.

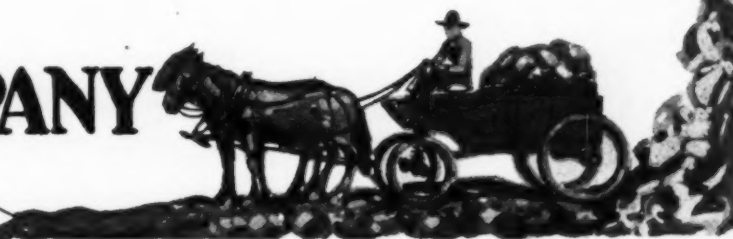
Send for your copy of our catalog today.

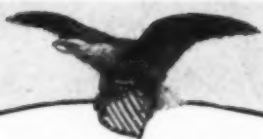


## SCRAPER COMPANY

ILL. U.S.A.

EXPORT DEPARTMENT  
ALLIED MACHINERY COMPANY OF AMERICA  
51 CHAMBERS ST., NEW YORK, U.S.A. CABLES ALMACOA NEW YORK






## Back of Your Machinery — the *BOILER*

People are too apt to look at the effect and forget the cause.

That's just the case with boilers.

They're the cause back of all this spectacular machinery performance.

A boiler is the heart of your machinery. Just as you look under the hood when you buy a car, look for the boiler that produces the power.



Farquhar's are the thorough-breds of the boilers. They pass, for one thing, hot and cold tests before we ship. And they never leak—they won't leak. That's because of the accurate punching and fitting of the rivet holes which means no drifting of holes to fit.

There is a whole story of boiler performance in this one fact. Let us send it to you.

**A. B. FARQUHAR CO.  
LIMITED**  
York, Pa.



# A. B. FARQUHAR CO., LIMITED

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## For Rapid Steady Excavating

**Y**OUR excavating equipment—how is it bought?

For the easy job; the usual job—or for the one that calls for rapid, steady, *hard* work under the most hazardous, exacting conditions.

Parsons Excavators are made for that emergency job that tests and strains. They can and do normal work, yet are the *only* machines with the inbuilt ability and strength to withstand overloading and overworking.

There are several Parsons Features you should know—the Short Route Delivery, the Positive Bucket Cleaning Device, the ample engine power, etc.

Parsons are built in both Oscillating and non-Oscillating or single hinge, non-shuttling types.

*Some Parsons cut all trench sizes  
Every Parsons cuts a range of sizes*

Our handsome catalog outlines the different types of Parsons. Send for it now to be sure you have it. Then ask a Parsons Service Engineer to select the machine for your needs.

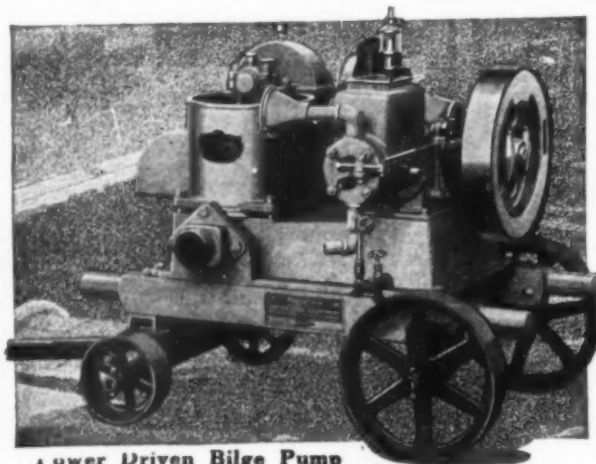
**THE PARSONS COMPANY, Newton, Iowa**  
New York Office, 18 W. 34th Street



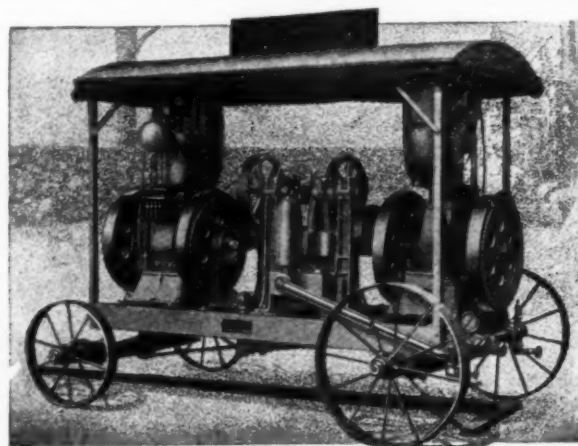
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# PARSONS EXCAVATING EQUIPMENT

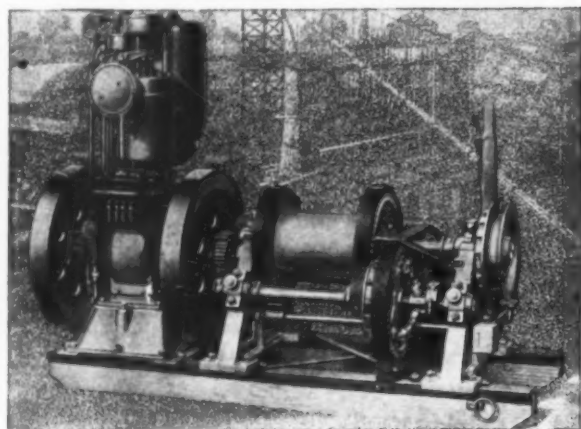




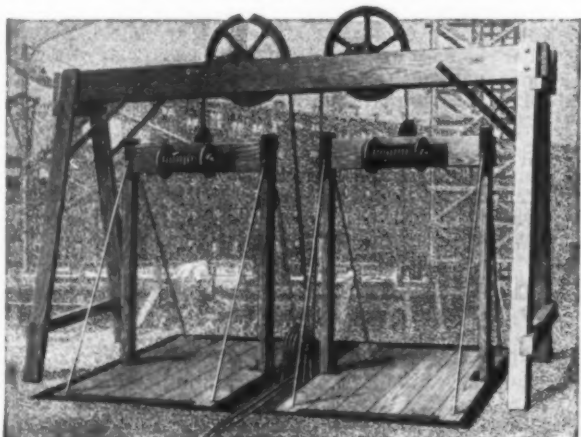
Power Driven Bilge Pump



Dual System Triplex Pump



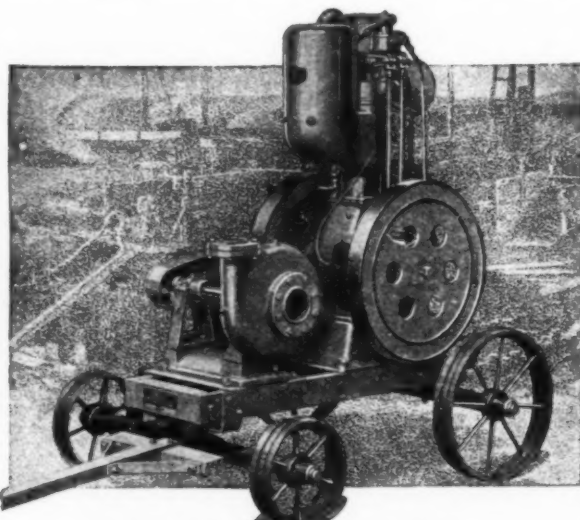
Double Acting Builder's Hoist



Material Elevator



Mortar Mixer



Power Driven Centrifugal Pump

## YOU ARE IN BUSINESS TO MAKE MONEY

CH&E Portable Saw Rigs, Power Pumps, Hoists and Engines will help you.

You can make every contract a bigger profit-payer and handle more jobs if you will put some part of the CH&E line of Contractors' Equipment to work for you.

This is the age of gasoline engines and electric motors—the old, slow, tedious hand methods are losing out. In these days of keen competition you must be up and doing—let your brain work while power does the hand work. A CATALOG SHOULD BE IN YOUR FILE. WRITE FOR IT.

**C. H. & E. Manufacturing Co.**

384-A Clinton Street Milwaukee, Wis.



## PORTABLE SAW RIGS, POWER PUMPS, HOISTS, MORTAR MIXERS, ENGINES

### 57 VARIOUS SIZES—

8 complete sizes Portable Saw Rigs (3 to 8 horse power), gasoline or kerosene engine or electric motor driven.

2 sizes Power Driven Trench Pumps.

9 sizes Power Driven Centrifugal Pumps.

5 sizes Power Driven Piston Pumps.

6 sizes Power Driven Triplex Pumps.

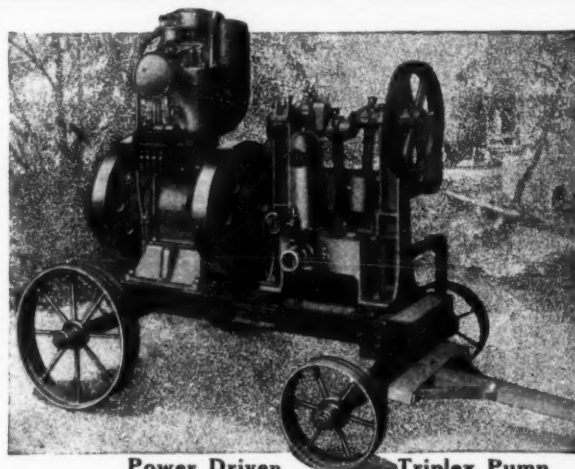
1 size Road Oil Pump and Expansion Joints for road builders' pipe lines.

9 sizes engine and motor driven Builders' Hoists and Material Elevators.

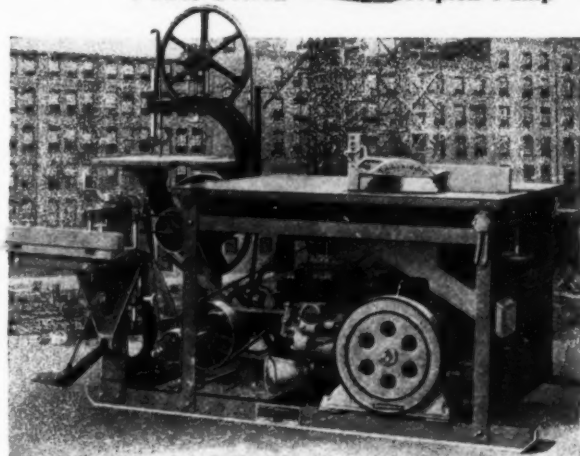
2 sizes Mortar Mixers.

8 sizes Gasoline and Kerosene Engines.

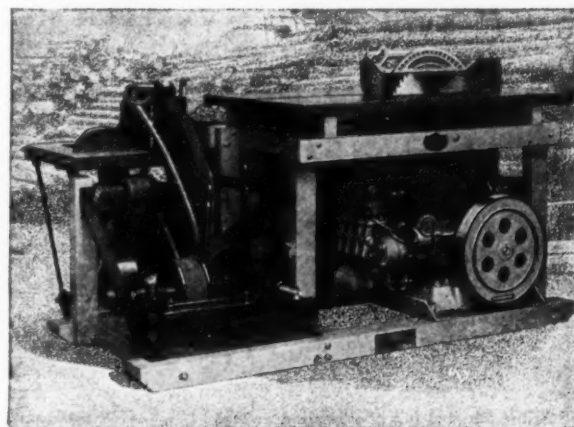
ASK FOR COMPLETE CATALOG



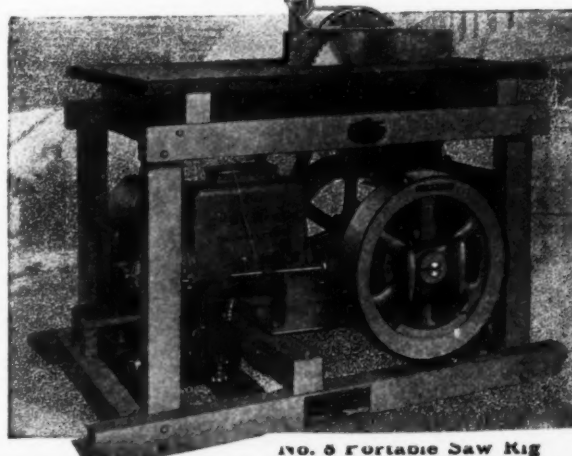
Power Driven Triplex Pump



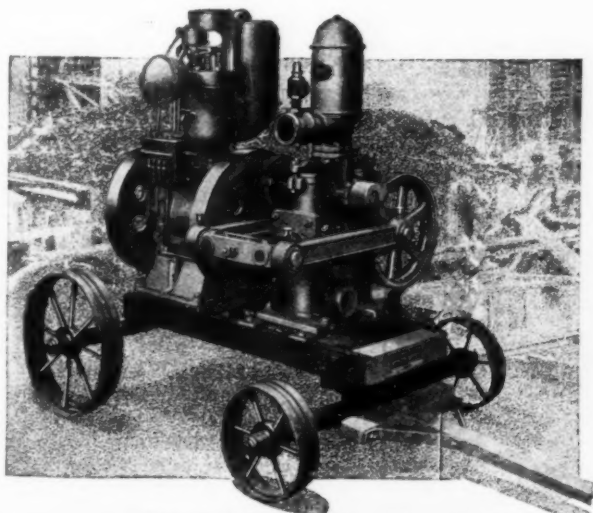
No. 6 Portable Saw Rig



No. 10 Portable Saw Rig



No. 6 Portable Saw Rig

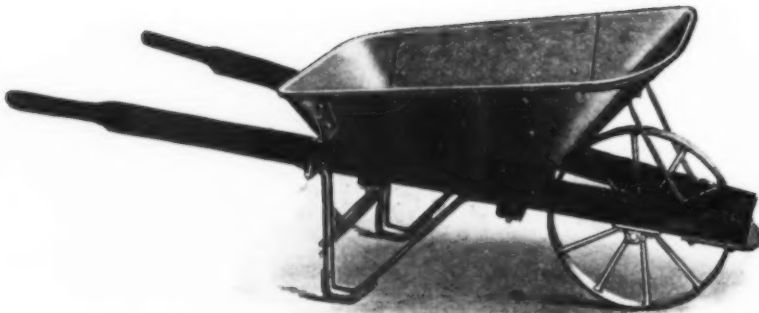


Power Driven Piston Pump

# *Sterling* STERLING ON A WHEELBARROW MEANS

## These Six Big

### *What They Mean to Wheelbarrow Buyers*



**S**IX exclusive Sterling features — six big points found in the construction of no other wheelbarrow—in them lies the universal preference for Sterling.

Please note the features as shown below. Each of them has definite, concrete advantages which mean money saved and work well done for you.

Some of these features add great strength — some add years to a wheelbarrow's life—all bring big savings in maintenance costs.

There's more to a wheelbarrow than you think—a great deal more. Why not post yourself for your pocket-book's sake? Write for facts at once.



### STERLING WHEELBARROW COMPANY

MILWAUKEE, WISCONSIN

New York Chicago Detroit Cleveland Boston

#### Feature No. 1

##### *Rivets vs. Stove Bolts*

Sterling Riveted leg construction cannot work loose. Stove bolts on ordinary wheelbarrows a constant source of trouble.

#### Feature No. 2

##### *This Broad Flat Leg Bearing With Extra Steel Shoe*

Heavy Channel Iron Construction. Lasts indefinitely. Never wears through as do usual pointed legs.

#### Feature No. 3

##### *Just a Cotter Pin But—*

It locks the axle so it can't turn with the hub. No nuts or bolts to work loose here nor to hinder the wheel. Think this little cotter pin over.





MORE THAN STERLING ON SILVER

*Sterling*

# Sterling Features

## What They Mean to Wheelbarrow Users

THEN, too, let's think of wheelbarrows as the men on the job do. They *know* the difference in wheelbarrows—the great difference between a Sterling and the ordinary one.

They know that the Sterling is at least 50% easier to wheel and handle than any other kind. One of our exclusive features makes this so.

They know the wheel never wobbles, and that a Sterling stands firmly without holding while being filled. They know all these and many performance facts.

Even if these Sterling features did not save from the buyer's point of view, wouldn't the facts quoted above bring you to them? Add one point of view to the other; it makes Sterling's inevitable. Catalogs are now ready. Send for them.

**STERLING WHEELBARROW COMPANY**  
MILWAUKEE, WISCONSIN

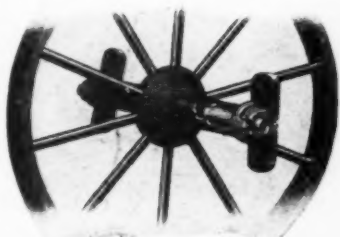
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### Feature No. 4

#### These Two Extra Spokes

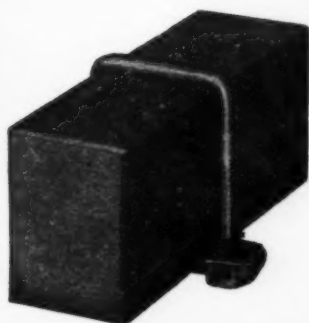
The only wheelbarrow wheel with ten spokes—others do with eight. The extra two double tire strength, end flattened and broken tires.



### Feature No. 5

#### Handles Clamped On

No bolt holes in the handles to weaken them. Here's added strength at the point of greatest strain. Sterling construction again.



### Feature No. 6

#### Self-lubricating Bearings Never Wear

No oiling—no squeaks—no worn out bearings. Sterling Bearings outlast the wheelbarrow or we replace them free. This self-lubricating feature reduces wheeling effort 50%.



# BARBER-GREENE COMPANY



## Load Fast—Get It Done

A pile of sand *here* must go over *there*; this stone pile must be moved up the line. It's jobs like these that cause delay and make the costs mount up.

Handling of material is necessary—but the manner in which you handle it is the *real* question you have to answer.

The quickest way to load material is with the

## B-G Self Feeding Bucket Loader

Time saved in labor alone makes this loader a capital investment. As a loader the B-G has no equal. You get the work done with speed.

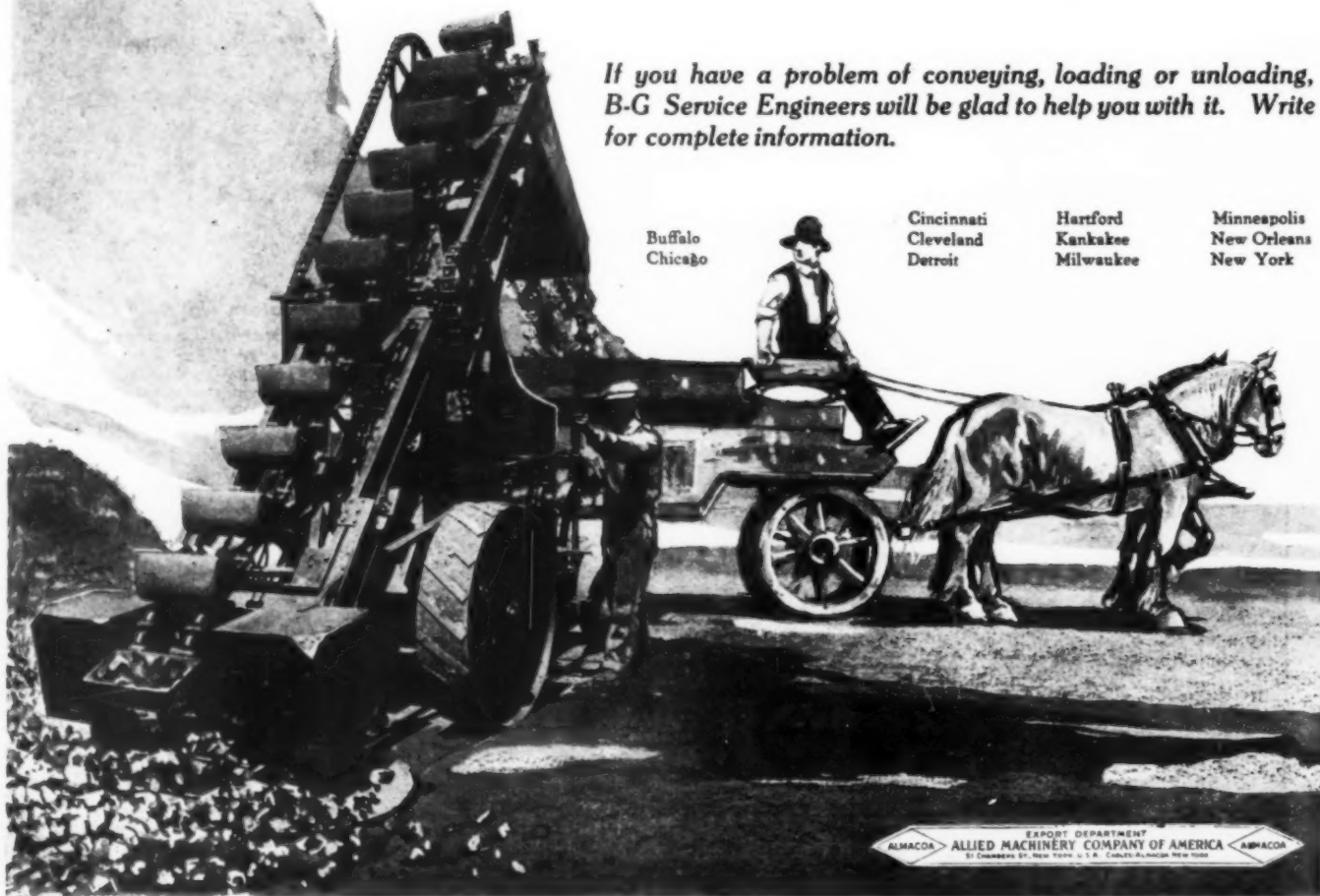
*If you have a problem of conveying, loading or unloading, B-G Service Engineers will be glad to help you with it. Write for complete information.*

Buffalo  
Chicago

Cincinnati  
Cleveland  
Detroit

Hartford  
Kankakee  
Milwaukee

Minneapolis  
New Orleans  
New York



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# BARBER-GREENE COMPANY

## The Disc Feeder Does It

The outstanding feature of this loader is the patented Rotating Disc Feeder. Located at the base of the elevator these discs rotate and carry the material to the center where the buckets pick it up. Large quantities of material are handled without moving the loader. The digging surface of the discs is wide and the loader operates dependably.

This Self Feeding feature alone makes the B-G loader the one for your jobs. Where it is a case of handling sand, gravel, stone, coal, coke, etc., you can't beat the B-G loader's performance.

Unless you know all about B-G loaders you are missing something on every loading job.

## Barber-Greene Company

485 West Park Ave., Aurora, Ill., U. S. A.

St. Louis  
Salem  
Salt Lake City

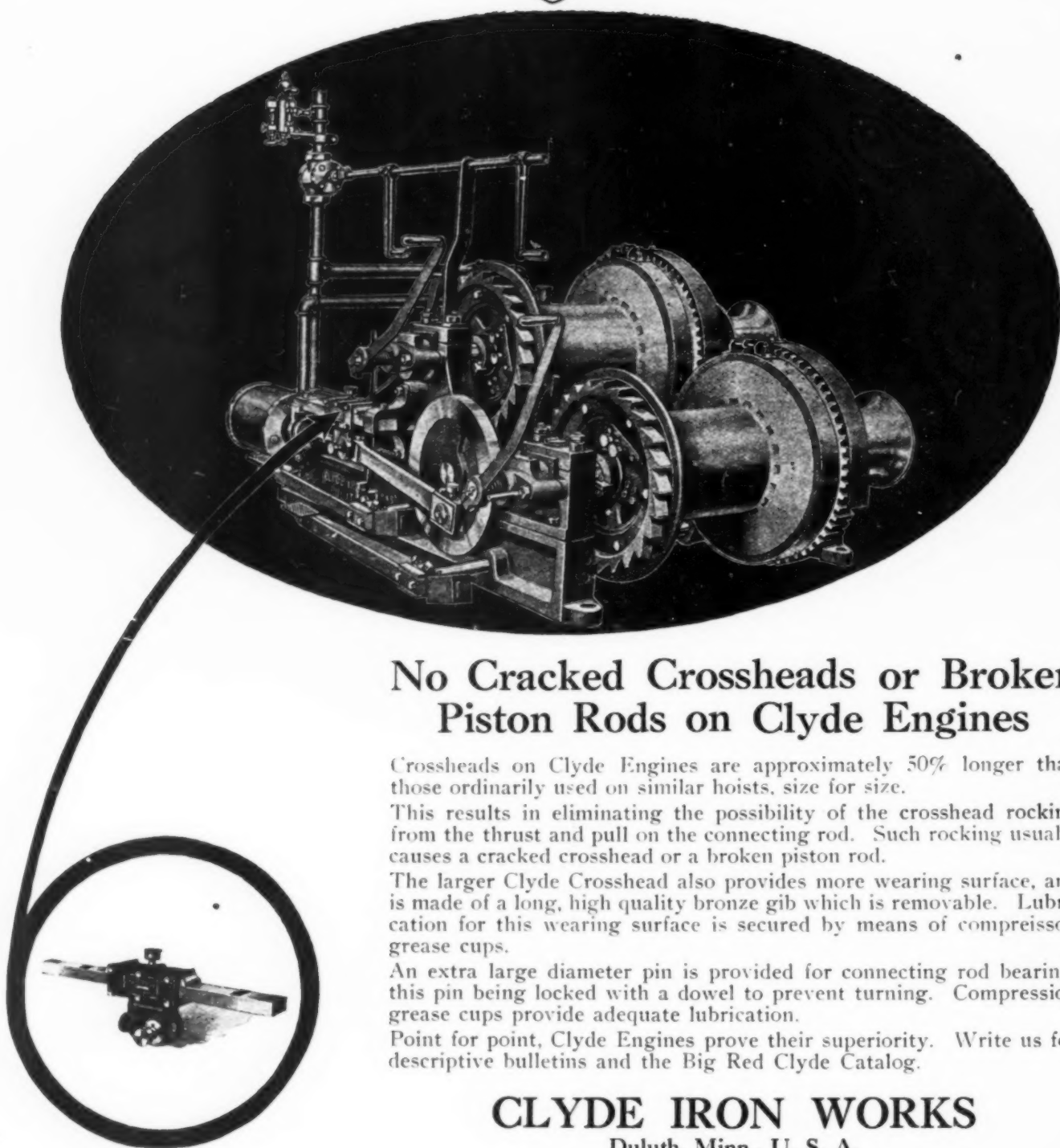
Norfolk  
Philadelphia  
Pittsburgh

Scranton  
Toledo  
Montreal





CLYDE



## No Cracked Crossheads or Broken Piston Rods on Clyde Engines

Crossheads on Clyde Engines are approximately 50% longer than those ordinarily used on similar hoists, size for size.

This results in eliminating the possibility of the crosshead rocking from the thrust and pull on the connecting rod. Such rocking usually causes a cracked crosshead or a broken piston rod.

The larger Clyde Crosshead also provides more wearing surface, and is made of a long, high quality bronze gib which is removable. Lubrication for this wearing surface is secured by means of compression grease cups.

An extra large diameter pin is provided for connecting rod bearing, this pin being locked with a dowel to prevent turning. Compression grease cups provide adequate lubrication.

Point for point, Clyde Engines prove their superiority. Write us for descriptive bulletins and the Big Red Clyde Catalog.

## CLYDE IRON WORKS

Duluth, Minn., U. S. A.

Branch Offices and Warehouses

NEW ORLEANS.....	414-416 Carondelet Street
CHICAGO.....	343 South Dearborn Street
SEATTLE.....	542 First Avenue, South
NEW YORK.....	50 Church Street
SAVANNAH.....	501 Germania Bank Building
PORTLAND, ORE.....	18th and Upshur Streets

# *Hoisting Machinery*